



AIR TRAFFIC MANAGEMENT OPERATIONAL CONTINGENCY PLAN FOR THE ARCTIC AREA

Second Edition

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FOREWORD

This document is for guidance only. Regulatory material relating to Arctic aircraft operations is contained in relevant International Civil Aviation Organization (ICAO) Annexes, *Procedures for Air Navigation Services-Air Traffic Management* (PANS/ATM, ICAO Doc 4444), *Regional Supplementary Procedures* (ICAO Doc 7030), State Aeronautical Information Publications and current Notices to Airmen, which should be read in conjunction with the material contained in this Document.

The airspace generally referred to as the Arctic area is comprised of the flight information regions (FIRs) in the vicinity of the North Pole. A number of States with oceanic control facilities geographically dispersed provide air traffic control services in this vast airspace with inherent communication, navigation and surveillance (CNS) limitations.

The Air Traffic Management Operational Contingency Plan for the Arctic area is primarily for the information of operators and pilots planning and conducting operations in the Arctic airspace. The intent is to provide a description of the arrangements in place to deal with a range of contingency situations.

This document will be made available electronically.

PART I - ATM CONTINGENCY PLAN FOR FLIGHTS OPERATING WITHIN THE ARCTIC FLIGHT INFORMATION REGIONS AND OCEANIC CONTROL AREAS

1. Objective

1.1. The Air Traffic Management (ATM) Operational Contingency Plan contains details of the arrangements in place to ensure the continued safety of air navigation in the event of partial or total disruption of Air Traffic Services (ATS) within and adjacent to the Arctic area. This document is produced in accordance with the requirement of the International Civil Aviation Organization (ICAO) Annex 11 – Air Traffic Services, Chapter 2, paragraph 2.29.

1.2. This plan details both common procedures throughout the Arctic area and the procedures specific to the individual air navigation service providers (ANSPs) within and adjacent to the Arctic area. The plan is presented in two parts:

Part I – Detailed Contingency Procedures for Individual Flight Information Regions and Control Areas

Air traffic control (ATC) services within and adjacent to the Arctic area are provided by a number of States in a number of geographical locations. This plan details the contingency arrangements at each of these facilities. It is considered unlikely that any physical contingency at one particular facility will affect another directly, hence in Part I of this document the procedures for each Flight Information Region (FIR) or Control Area (CTA) are considered independently.

Part 2 – Contingency Situations Affecting Multiple FIRs

This part of the plan considers events which are likely to affect more than one facility within and adjacent to the Arctic area. In particular, these include the contingency arrangements in place to deal with the airspace contaminated by volcanic ash.

2. States and FIRs affected

2.1. This document contains contingency procedures for those ANSPs providing an ATC service within and adjacent to the Arctic area.

2.2. The States, FIRs and area control centers (ACCs) affected by this contingency plan and for which procedures are promulgated are:

Canada - Edmonton FIR
Iceland - Reykjavik Oceanic FIR/CTA
Japan – Fukuoka FIR
Norway - Bodo Oceanic FIR
Russian Federation
 - Magadan FIR
 - Murmansk FIR
United States - Anchorage Arctic FIR

3. Scope of the Plan

3.1. This plan addresses contingency situations which may result in a degradation of the ATC service provided (limited service) as well as situations where there is a total loss of the ability to provide ATC services (no service). It also provides information on:

- a. common procedures adopted by ATC facilities in the event of contingency situations; and
- b. detailed procedures adopted by individual ATC facilities in the event of a contingency situation.

3.2. Where available, information is provided outlining the steps taken by ANSPs to deal with a long term unavailability of an ATC facility. In particular, the procedures detailed by each ATC facility will, insofar as possible, include the following for the FIRs for which the contingency plan applies:

- a. FIRs with supporting procedures;
- b. Notification procedures;
- c. Contingency route structures for activation within the FIR, as well as for activation within an adjacent FIR;
- d. Long term contingency arrangements
- e. Contact details

3.3. The plan also provides arrangements for implementation of:

- a. *limited service* in the case of:
 - i. disruption of ground/air communication capability, and/or
 - ii. disruption of ability to provide control services; and
- b. *no service* in the case of:
 - i. loss of ground/air communication capability, and/or
 - ii. loss of ability to provide control services.

4. Implementation of the plan

4.1. In the event of the need to adopt contingency procedures, ANSPs will notify all affected agencies and operators appropriately. In *limited service* situations the ANSP will determine the level of notification necessary and take action as required to cascade the information. In *no service* situations it is likely that the ATC facility involved will be subject to evacuation. In this instance, the ANSP will issue Notices to Airmen (NOTAMs) and broadcast on appropriate frequencies that contingency procedures have been initiated.

4.2. The notification process employed by individual ANSPs is detailed in their respective entries in this plan, however the general format will be as follows:

- a. Issue a NOTAM advising operators of the evacuation. The following is an example of the type of information which may be promulgated:

“DUE TO EMERGENCY EVACUATION OF [*name of facility*], ALL ATC SERVICES ARE TERMINATED. FLIGHTS WITHIN [*name*] FIR SHOULD CONTINUE AS CLEARED AND CONTACT THE NEXT ATC AGENCY AS SOON AS POSSIBLE. FLIGHTS NOT IN RECEIPT OF AN OCEANIC CLEARANCE SHOULD LAND AT AN APPROPRIATE AIRFIELD OR REQUEST CLEARANCE TO AVOID [*name*] FIR. FLIGHTS SHOULD MONITOR [*list frequencies*].”

- b. Broadcast an evacuation message on appropriate frequencies:

“EMERGENCY EVACUATION OF [*name of facility*] IS IN PROGRESS. NO AIR TRAFFIC CONTROL SERVICE WILL BE PROVIDED BY [*name of facility*]. USE EXTREME CAUTION AND MONITOR [*list frequencies*], EMERGENCY FREQUENCIES, AND AIR TO AIR FREQUENCIES. CONTACT THE NEXT AIR TRAFFIC CONTROL UNIT AS SOON AS POSSIBLE.”

5. Traffic Information Broadcast by Aircraft (TIBA) procedures

5.1. The following Traffic Information Broadcast by Aircraft (TIBA) communications procedures have been developed in accordance with ICAO Annex 11, *Air Traffic Services*, Attachment C. These procedures should be applied by pilots when executing an altitude change to comply with a previously issued oceanic clearance:

- a. At least 3 minutes prior to the commencement of a climb or descent the flight should broadcast on the last assigned frequency, 121.5, 243.0 and 123.45 the following:

“ALL STATIONS [*callsign*] [*direction*] DIRECT FROM [*landfall fix*] TO [*oceanic entry point*]. LEAVING FLIGHT LEVEL [*number*] FOR FLIGHT LEVEL [*number*] AT [*distance*] [*direction*] FROM [*oceanic entry point*] AT [*time*].”

- b. When the level change begins, the flight should make the following broadcast:

“ALL STATIONS [*callsign*] [*direction*] FROM [*landfall fix*] TO [*oceanic entry point*]. LEAVING FLIGHT LEVEL [*number*] NOW FOR FLIGHT LEVEL [*number*].”

- c. When level, the flight should make the following broadcast:

“ALL STATIONS [*callsign*] MAINTAINING FLIGHT LEVEL [*number*].”

**PART II - DETAILED CONTINGENCY PROCEDURES FOR INDIVIDUAL
FLIGHT INFORMATION REGIONS (FIRs)**

CHAPTER 1: ANCHORAGE ARCTIC FIR

FIRS WITH SUPPORTING PROCEDURES

None

GENERAL PROVISIONS

Traffic flow in the Anchorage Arctic FIR is largely east to west. Flights operating between North America and Asia generally find clear skies and light and variable winds and an attractive and reliable route to avoid North Pacific jet streams. There is also west to east traffic and occasional south to north traffic from Anchorage to Europe. Eastbound and westbound traffic flows between established fixes in the Magadan and Murmansk FIRs to restricted points of latitude in the Edmonton FIR. In general, Anchorage Arctic FIR acts as a link between these two neighboring facilities, and very few route or altitude changes occur in the Anchorage Arctic FIR.

Communications in this area are provided through a number of resources. Anchorage Air Route Traffic Control Center (ZAN) has very high frequency (VHF) and ultra high frequency (UHF) locations along the Arctic coast of Alaska. Remote communication sites are located at Barter Island (BTI), Deadhorse (SCC), Barrow (BRW) and Point Lay (PIZ). Primary reporting along 141W, the ZAN/Edmonton boundary, is done through Gander high frequency (HF) Radio. Primary reporting along 169W, the ZAN/Magadan boundary is done through Magadan HF Radio. Service is augmented by San Francisco ARINC through HF, VHF and Long Distance Operational Control (LDOC) capabilities. Iceland Radio also has capabilities in the Anchorage Arctic FIR.

Surveillance is achieved through radar to approximately 72N. Radar sites are located at BRW, SCC and BTI. Anchorage also has Automatic Dependent Surveillance-Contract (ADS-C) capabilities up to approximately 83N. Though Arctic ADS-C aircraft are not currently displayed on ZAN radar scopes, once the Ocean 21 automation system is implemented in portions of the Anchorage Arctic FIR, these reports will be displayed.

LEVELS OF SERVICE

Limited Service: A limited service could result from:

- Staffing Shortage
- Minor equipment outage
- Failure in a support facility

No Service: A loss of all service could result from:

- Major equipment outage
- Loss of ZAN facility
- Evacuation of facility

Limited Service

Limited Communications

Due to redundancies in ZAN communication, the loss of a single communication service provider would not create a significant reduction in communication services in the Anchorage Arctic FIR. In the event of lost VHF capability there is sufficient HF coverage to provide regular service. Murmansk Area Control Centre (ACC), Edmonton ACC, and Magadan ACC would be advised and control messages could be passed by Gander and San Francisco HF Radio.

A loss of either San Francisco or Gander Radio would also not cause a disruption in basic services in Anchorage Arctic FIR. The two facilities' coverage is largely redundant in the Anchorage Arctic area. Murmansk ACC, Edmonton ACC, and Magadan ACC would be advised to use alternate HF frequencies where required. Any required HF broadcast required through Gander Radio could be supplemented by Iceland Radio. Direct satellite voice communication is available up to 83N through the INMARSAT network, and aircraft with Iridium have coverage up to the North Pole.

Limited Air Traffic Service

In the event of limited air traffic services, ZAN supervisors would communicate with neighboring facilities as to the nature of the limitation, and provide any restrictions that need to be imposed. As much notice as possible would be proffered to airspace users to allow them time to make informed flight planning decisions. All normal routes and restrictions would remain in place. The ZAN Traffic Management Unit (TMU) would coordinate with all affected facilities as to flow rates and slot times if necessary.

No Service

Loss of Ground-to-Air Communications

In the event ZAN is unable to communicate with traffic in the Anchorage Arctic FIR, aircraft would be expected to remain on their current routes and altitudes until communications with another air traffic service provider can be established. Aircraft would be expected to maintain their filed airspeed or last assigned mach number. Edmonton ACC, Murmansk ACC, and Magadan ACC would be advised of the situation, and each would be asked for locations that they will have communication on various routes. Each facility would be advised to broadcast to aircraft that communications with ZAN is not possible at this time, and the place and frequency to contact the next facility. Boundary estimates would continue to be passed by ZAN to the required facilities via the normal or backup communications channels available.

No restriction of service or airspace would be expected from a loss of communication with aircraft transiting the Anchorage Arctic FIR.

Loss of ATC Service (ATC ZERO)

In the event of complete loss of ZAN's ability to provide air traffic services in the Anchorage Arctic FIR, immediate notification would be made to Murmansk ACC, Magadan

ACC, and Edmonton ACC. Flights already airborne would be allowed to continue through Anchorage Arctic FIR. Murmansk ACC would be advised to pass DEKMO estimates directly to Edmonton ACC. Magadan ACC would be advised to request 141W crossing estimates from aircraft bound for Canadian airspace and pass these estimates and altitudes to Edmonton ACC. Edmonton ACC would be advised to request Russian entry fix estimates and pass them to Magadan. All aircraft not yet airborne would be held on the ground until they could flight plan around the affected airspace or an appropriate air traffic flow management (ATFM) program could be established.

Loss of Interfacility Communications

All communication between support facilities would be done by commercial telephone. All requisite numbers are included in the "Contact Details" section at **Appendix I-1-A**.

RESUMPTION OF SERVICE

All affected facilities would be advised when ZAN was able to resume full or partial ATC services. If ZAN was forced to resume service from a remote location, partial service would be expected for an undetermined period of time.

CONTACT DETAILS – ANCHORAGE CENTER

| Facility | Telephone Number | AFTN |
|-------------------------------|---|-------------|
| Anchorage Center (ZAN) | | PAZAZQZX |
| Operations Manager in Charge | 1-907- 269-1103 | |
| North Area Supervisor | 1-907-269-1915 | |
| Magadan ACC | | UHMMZRZX |
| Operations Supervisor | 011-7-413-260-6719 Or 011-7-413-260-7180 | |
| HF | 2884, 5550, 8837, 11390 | |
| Murmansk ACC | | ULMMZOZX |
| Operations Supervisor | 011-7-815-228-1314 | |
| HF | 8950, 11390 | |
| Edmonton Centre | | CZEGZQZX |
| Shift Manager | 1-780-890-8397 | |
| North-High Supervisor | 1-780-890-4712 | |
| Gander Radio | | CYQXYSYX |
| Shift Manager | 1-709-651-5222 | |
| HF | 2971, 4675, 8891, 11279 | |
| San Francisco ARINC | | KSFOXAAG |
| Team Leader | 1-925-294-8400 | |
| Arctic HF | 6640, 11342, | |
| Satellite Voice | 1-410-266-4430 | |

CHAPTER 2: BODO OCEANIC FIR

FIRs WITH SUPPORTING PROCEDURES

Reykjavik FIR
Norway FIR, Stavanger Area of Responsibility (AoR)
Norway FIR, Oslo AoR
Sweden FIR, Stockholm AoR
Fin FIR, Rovaniemi AoR
Murmansk FIR

LIMITED SERVICE

The Regional Rules and Regulation for Bodo Oceanic Area Control Centre (OAC) address the issues of limited service provision in the North Atlantic (NAT) Region. In the event that Bodo OAC/Air Traffic Control Centre (ATCC) must be evacuated, the procedures for NO SERVICE will immediately be activated.

Once the Bodo Area Control Centre (ACC) has been sterilized of oceanic traffic, the rebuilding of service provisions will begin.

Until full service can be re-established, Bodo OAC will delegate control of aircraft within Bodo Oceanic Control Area (OCA) to Stavanger ATCC, Bodo ATCC Domestic sectors, Stockholm ACC and Reykjavik ACC.

Level 1: Emergency Services

Control services to Emergency and Humanitarian flights, along with limited Airspace Reservations (no aircraft joining or departing)

Level 2: Domestic Sector Operation

Emergency and Humanitarian flights along with limited Airspace Reservations (no aircraft joining or departing) would take priority. Control service provided through minimum staff with limited equipment. This would result in metered flow through the Bodo OCA of commercial, general aviation, military and State aircraft.

Level 3: Capacity Limited, Normal Control Service

Emergency and Humanitarian flights, along with limited Airspace Reservations (no aircraft joining or departing) would take priority. Control service with accompanying clearance delivery communication would be offered through an increased number of operating positions. Flow restrictions and metering would be established to reduce congestion.

Level 4: Normal Control Service

Provide control service using Bodo Domestic Sectors and Stavanger ATCC. ALL required VHF and HF communication will be available. The Bodo ATCC, Domestic Sectors will provide the full range of services required by westbound aircraft, and coordinate the traffic with adjacent centre.

Level 5: Total Restoration of Services by Bodo OAC

Full oceanic en route and planning service restored. Control of Bodo OCA is returned back to Bodo OAC. Normal communication capabilities.

Dispersal of Air Traffic

Aircraft already within the Bodo OCA will be given priority for the limited services available. Aircraft intending to enter Bodo OCA will, if necessary, be restricted to meet the limited service capability. Random westbound routing may be restricted.

Communications

Communication services will be maintained to the possible extent using available equipment supplemented with the assistance of adjacent facilities. Aircraft unable to contact Bodo Radio on high frequency (HF) shall call one of the following stations:

Iceland Radio
Shannon Aeradio

Notification

Bodo OAC will notify all adjacent units and co-ordinate necessary traffic restrictions.

Responsibilities of Adjacent OACs and ATCCs

Upon notification by Bodo OAC, the adjacent facilities shall be responsible to implement procedures necessary to meet Bodo OCA restrictions.

For westbound traffic, Bodo OAC will issue clearances to 0° Longitude only. Reykjavik OAC will assume responsibility west of 0° Longitude. Eastbound traffic will be accepted as normal.

Separation Minima

Bodo OAC will be responsible for ensuring the coordination and implementation of any additional separation standard.

Same direction longitudinal separation may be increased if (e.g. add 3 minutes). Lateral separation will not be increased. Flight profile changes in the Bodo OCA may be limited.

Contingency Tracks

Bodo OAC shall publish contingency tracks within the Bodo OCA and ensure that the available limited air traffic services are not overloaded.

Air Traffic Flow Management (ATFM) Requirements

Bodo OAC will, in conjunction with the EUROCONTROL Central Flow Management Unit (CFMU), initiate ATFM measures as required.

NO SERVICE

Bodo ATCC includes Bodo Domestic Control, Bodo Oceanic Control and Bodo HF. Should Bodo ATCC be evacuated, the potential exists for a major disruption to air traffic control service within Bodo AoR (Norway FIR from 62N to Russian Border boundary) and Bodo Oceanic FIR/OCA.

As soon as possible after evacuation, a Contingency Message will be forwarded to all concerned agencies.

Dispersal of Air Traffic

Where possible, aircraft already within the Bodo OCA will be notified that no services are available. Oceanic traffic intending to operate through Norwegian domestic airspace will require further clearance to do so.

Aircraft that elect to continue flight through Bodo OCA will operate on published tracks and at published flight levels. Aircraft that are already on random tracks will require specific co-ordination and approval from all concerned air traffic services (ATS) units until the contingency tracks become active. The lowest flight level (FL) available for transiting flights will be FL280. Traffic to and from Svalbard/Longyear will use flight levels appropriate to direction of flight until exiting Bodo OCA. The highest available flight level will be FL270.

Communications

Bodo Radio and adjacent facilities will extend HF monitoring and assist with flight information services to aircraft within or about to enter Bodo OCA. If unable to establish radio contact with adjacent facilities, flights may use SATCOM voice and satellite telephone to provide position reports.

Notification

Bodo OAC will attempt to notify adjacent units of the loss of service. If adjacent units are unable to establish contact with Bodo OAC, the phone numbers listed in **Appendix I-2-A** can be used. Adjacent facilities are also listed.

Responsibilities of Adjacent OACs and ATCCs

Adjacent OACs/ATCCs should implement ATFM measures as required. In addition, they may co-ordinate and publish routes to minimize the impact of the loss of service. Norwegian domestic ATCC will ensure that the necessary oceanic separation minima are established for traffic entering Bodo OCA from their area.

Reykjavik OAC will be required to:

- a. Clear eastbound traffic in accordance with the contingency tracks and provide necessary separation; and
- b. Organize a method of passing and receiving estimates with the Norwegian domestic ATCC.

Separation Minima

Longitudinal separation for all traffic entering Bodo OCA from Norwegian domestic airspace shall be increased by 10 minutes.

Contingency Tracks

The contingency tracks, FL280 or above, will be laterally separated and will use flight levels appropriate to direction of flight. Before leaving Bodo OCA, aircraft operating on contingency tracks shall request a clearance from the appropriate adjacent unit. Change of flight level will not be permitted while on the contingency tracks.

Air Traffic Flow Management

Bodo OAC will, in conjunction with the CFMU, initiate ATFM measures as required.

FLIGHT CREW AND OPERATOR PROCEDURES

Within Bodo OCA

The procedures outlined below are to be used as guidance for pilots in the immediate aftermath of sudden withdrawal of the ATC service as described above.

On receipt of the Contingency Message, pilots are requested to broadcast the information to other flights on VHF frequency 127.725 or 121.5.

Flights should establish communication with the next agency at the earliest opportunity stating current position, cleared flight level, next position and estimate and subsequent position. This also applies to flights using automatic position reports.

If unable to establish radio contact, flights may use SATCOM voice or satellite telephone as follows to provide position reports:

| Oceanic Centre | Reykjavik | Santa Maria | New York | Ballygirreen (Shanwick Aeradio) | Bodo |
|---|------------------|---|--------------------|--|-----------------|
| Telephone Number | +354 424 4141 | +351 296 820 438 +351 296 886 042 (satellite link) | +1 631 468 1413 | +353 61 471 199 | +47 75521283 |
| SATCOM INMARSAT Short Code | 425101 | 426305 | 436623 | 425002 | 425702 |

Flights may request their flight dispatch offices to forward position reports if sending position reports to multiple ATS units or if otherwise unable to forward position reports.

Flights operating with a received and acknowledged oceanic clearance will be expected to continue in accordance with the last clearance issued unless otherwise advised by ATC.

Flights involved in level change should complete the maneuver as soon as possible in accordance with the clearance.

Flights making automatic position reports are required to make voice position reports whilst within the Bodo OCA unless advised otherwise.

Communications with the next ATS unit should be established at the earliest opportunity. Where no contact with the next agency can be established, Shanwick radio should be contacted on HF for advice.

For Flights Approaching the Bodo OCA when the Contingency is Activated

NOT in Receipt of an Oceanic Clearance

In the event that Bodo OACC must be evacuated, only aircraft with received and acknowledged oceanic clearances shall be permitted to transit Bodo OCA.

If aircraft are unable to obtain or acknowledge an oceanic clearance, flights must plan to re-route around the Bodo OCA or to land at an appropriate aerodrome. Request the appropriate re-clearance on the current frequency.

In Receipt of an Acknowledged Oceanic Clearance

Aircraft operating with a received and acknowledged oceanic clearance should proceed in accordance with the clearance. Flights should not request changes in altitude, speed or route except for reasons of flight safety or to comply with the oceanic clearance.

Entering from another OCA

Flights within Reykjavik Oceanic Airspace, can anticipate a large re-route to avoid the Bodo OCA. Reykjavik will issue advice on procedures to be followed.

Bodo OCA Contingency Tracks, FL280 or above (Latitude at 0°)

Domestic border/Landfall

80N/ TRO

72N/AND

70N/ BDO

69N/OGPAR

68N/BNN

67N/TRM

66N/ABADA

65N/VIG

64N/FLS

BODO OACC – CONTINGENCY ROUTE STRUCTURE

For activation within Bodo FIR

CONTACT DETAILS – BODO ATCC

| Facility | Telephone Number | AFTN |
|------------------------------|-------------------------|----------------------|
| Bodo ATCC | | ENOBZQZX ENBDZQZX |
| ACC Supervisor | +47 755 42900 | |
| Manager Bodø ATCC | +47 670 33751 | |
| Head of operations Bodø ATCC | +47 670 33753 | |

CHAPTER 3: EDMONTON FIR

FIRs WITH SUPPORTING PROCEDURES

None

NOTIFICATION PROCEDURES

In a **limited service** situation notification of any service limitations and traffic management measures will be promulgated to operators and adjacent air navigation service providers (ANSPs) via Aeronautical Fixed Telecommunications Network (AFTN).

In a **no service** situation the Edmonton Area Control Centre (ACC) is likely to have been evacuated. As soon as possible after evacuation a Contingency Message will be sent to adjacent agencies. In turn, they are expected to advise the affected traffic.

LIMITED SERVICE - PROCEDURES

Disruption of Ground/Air Communication Capability

Communication services will be maintained using available equipment supplemented with the assistance of adjacent facilities. High frequency (HF) services in Northern Canada are ordinarily provided by CYQX International Flight Service Station and Arctic Radio. Appropriate frequencies will be published in the daily air traffic flow management (ATFM) messages (Notice to Airmen (NOTAM), Advisory)

Disruption of Ability to Provide Control Services

Edmonton ACC shall determine, co-ordinate and promulgate any necessary restrictions to meet the service limitation. Enroute re-clearance of such traffic shall not be permitted except in emergency.

Separation Standards

Edmonton ACC will be responsible for ensuring the co-ordination and implementation of any additional separation requirements.

Contingency Tracks

Dependant on the nature of the service limitation, Edmonton ACC may promulgate and activate contingency tracks listed in the contingency plan.

Air Traffic Flow Management

Edmonton ACC shall co-ordinate any necessary traffic management measures where necessary with the NAV Canada National Operations Centre. Such measures may include, but are not limited to, temporary capacity restrictions and tactical rerouting measures.

Edmonton ACC shall co-ordinate these restrictions where necessary with adjacent ACC/Air Route Traffic Control Centers (ARTCCs) where they may affect the flow of traffic through these units airspace.

Responsibilities of Adjacent ACC/ARTCCs

The action required of adjacent ANSPs will vary depending on the nature of the service limitation. Where such action is not contained within the inter-centre Letters of Agreement (LOA), the requirement will be promulgated within the initial failure and restrictions message.

NO SERVICE - PROCEDURES*Loss of Ability to Provide Control Services and Ground/Air Communication Capability*

Edmonton Area Operations Center (AOC) includes Edmonton Area Control and Edmonton Flight Information Center (Edmonton Radio). Should Edmonton AOC be evacuated, the potential exists for a major disruption to ATC services in the Edmonton FIR.

As soon as possible after evacuation a contingency message will be forwarded to all concerned agencies, either directly or through the NAV Canada National Operations Centre.

Until these contingency plans can be implemented, it is possible that the Edmonton FIR may contain unexpected (not contingency route) traffic en-route to adjacent facility airspace. It is suggested that facilities adjacent to Edmonton take the following action:

- Increase or extend HF communication position report monitoring to include aircraft in Edmonton airspace;
- Pass traffic information on known Edmonton traffic to the next en-route facility after Edmonton; and;
- Prohibit profile changes (altitude and route) for aircraft exiting the Edmonton area until it can be safely assumed that there is no unknown traffic in that aircraft's vicinity.

All traffic en-route to Edmonton FIR not having Edmonton approval shall be routed to remain clear of Edmonton FIR.

FLIGHT CREW AND OPERATOR PROCEDURES*For Flights within the Edmonton FIR – General*

The procedures outlined below are to be used as guidance for pilots in the immediate aftermath of a sudden withdrawal of the ATC service as described above.

On receipt of the Contingency Message, pilots are requested to broadcast to other flights on 121.5 and 123.45. A listening watch on these frequencies must be maintained.

Flights should establish communication with the next agency at the earliest opportunity stating current position, cleared flight level, next position and estimate and subsequent position. This also applies to flights using automatic position reports (Automatic Dependent Surveillance (ADS) or Flight Management Computer (FMC)) as these reports may not have been received by the next agency.

When ADS equipped flights are notified of an Edmonton evacuation they must revert to voice position reporting until clear of Edmonton FIR, or notified otherwise.

Any flights involved in level changes should complete the maneuver as soon as possible in accordance with the clearance.

If unable to establish radio contact, flights may use SATCOM voice or satellite telephone to provide position reports.

| CENTRE | TELEPHONE NUMBER | SATCOM INMARSAT SHORT CODE |
|-----------|------------------|----------------------------|
| REYKJAVIK | 00 354 424 4141 | 425101 |
| ANCHORAGE | 001 907 269 1103 | 436602 |
| WINNIPEG | 001 204 983 8338 | 431608 |
| MONTREAL | 001 514 633 3211 | 431605 |
| VANCOUVER | 001 604 586 4500 | 431607 |

Flights may request their flight dispatch offices to forward position reports, if sending position reports to multiple ATS Units (ATSU) or if otherwise unable to forward position reports.

Communications with the next ATSU should be established at the earliest opportunity. Where no contact with the next agency can be established, Gander/Arctic radio should be contacted on HF or nearest Radio on 126.7 for advice.

For Flights Approaching the Edmonton FIR when the Contingency is Activated

Aircraft operating on a clearance should proceed in accordance with the clearance. Flights should not request changes in altitude, speed or route except for reasons of flight safety.

However, due to the uncertainty surrounding the contingency situation, pilots are strongly advised to be ready for a possible re-route clear of the Edmonton FIR.

EDMONTON ACC – CONTINGENCY ROUTE STRUCTURE

In the event that Edmonton ACC must be evacuated, only aircraft with a clearance on a contingency route and appropriate altitude will be permitted to transit the Edmonton FIR.

If aircraft are unable to obtain a contingency route clearance, flights must plan to re-route around the Edmonton FIR or to land at an appropriate aerodrome. Request the appropriate re-clearance on the current frequency. Frequency congestion is likely.

Based on where they enter the Edmonton FIR, flights shall proceed in accordance with Table 3-1, Edmonton Contingency Route Plan, until communication is established with, and a re-clearance issued by, the next agency.

1 MAR 08



Table 3-1. Edmonton Contingency Route Plan

LONG TERM CONTINGENCY ARRANGEMENTS

Refer to the Edmonton Area Control Centre Facility Recovery Document.

CONTACT DETAILS - EDMONTON ACC

| | |
|------------------------------|-------------------|
| Edmonton Shift Manager | +1 780 890 8397 |
| Nav Canada Operations Centre | +1 613 563 5626 |
| Vancouver ACC | +1 604 775 9622 |
| Winnipeg ACC | +1 204 983 8338 |
| Montreal ACC | +1 514 633 3365 |
| Anchorage ARTCC | +1 907 269 1103 |
| Salt Lake ARTCC | +1 801 320 2560 |
| Seattle ARTCC | +1 253 351 3520 |
| Reykjavik ACC | +011 354 424 4141 |

EVACUATION MESSAGES – EDMONTON ACC

“EMERGENCY EVACUATION OF EDMONTON CENTRE AND EDMONTON RADIO IN PROGRESS. NO IFR CONTROL SERVICE WILL BE PROVIDED BY EDMONTON. I REPEAT, NO IFR CONTROL SERVICE WILL BE PROVIDED BY EDMONTON. USE EXTREME CAUTION AND MONITOR THIS FREQUENCY, EMERGENCY FREQUENCIES AND AIR TO AIR FREQUENCIES. ALL FLIGHTS ARE TO CONTACT THE NEXT ATC UNIT AS SOON AS POSSIBLE. PLEASE BROADCAST THIS INFORMATION ON 123.45, 121.5 AND 243.0”

CHAPTER 4: FUKUOKA FIR

FIRs WITH SUPPORTING PROCEDURES

None

GENERAL PROVISIONS

Oceanic control service within Fukuoka FIR is provided by ATM Center (ATMC). The oceanic airspace, which is largely affected by jet stream, has three main traffic flows; to/from North America and Japan/Asia, Japan and Oceania, Japan and Southeast Asia.

VHF and HF communications relayed by Tokyo Radio, and CPDLC through satellite system are used for the oceanic control. Also, ATMC applies ADS-C distance-based separation standards between the aircraft which utilize ATS datalink services.

LEVELS of SERVICE

Limited service situations can be caused by:

- minor equipment failures
- failures in ancillary facilities

No service situations can be caused by:

- serious equipment failures
- evacuation of facility's personnel

LIMITED SERVICE – PROCEDURES

Limited Communications

Since Tokyo Radio has both main and backup HF communication sites, the loss of single communication channel will not affect a significant reduction in communication services for the oceanic airspace.

In case that Tokyo Radio totally loses its HF communication capability, communication by CPDLC will be continuously maintained. Aircraft equipped with CPDLC may be asked to relay messages to the nearby aircraft with non-CPDLC. In the event of CPDLC communication failure, the aircraft will switch to HF communication alternatively.

Limited ATS

In case of minor equipment failure, air traffic services will be provided by using backup ATC equipment. In the event that ADS-C distance-based separation is unable to be applied, ATC workload will highly increase to establish necessary separation such as by instructing altitude

changes.

Also, depending on the situation, both domestic and foreign adjacent ACCs may be advised some restrictions regarding the aircraft entering to the oceanic airspace from domestic airspace or neighboring FIRs.

NO SERVICE – PROCEDURES

Disruption of Ground/Air Communication Capability

When communication capabilities in the oceanic airspace are totally lost, aircraft will be expected to proceed to their destination airports by following their last assigned routes until communication with any other domestic or foreign facility can be established. Both ATMC and aircraft will attempt any measures to establish communication with each other, and once it is re-established, the aircraft will be informed as appropriate.

Furthermore, necessary restriction for the aircraft entering to the oceanic airspace will be coordinated with neighboring ACCs in order for the safety of aircraft.

Loss of Ability to Provide Control Services (Total Loss of Control)

Even in the event of complete loss of ATMC's ability to provide oceanic control service in Fukuoka FIR, HF communication by Tokyo Radio would still be available so that the aircraft could contact for information.

The oceanic control service will be resumed at SDECC (Systems Development Evaluation and Contingency Management Center) when the air traffic controllers have moved from ATMC.

Loss of Communication between ATC Facilities

In the event of loss of communication between ATC facilities, commercial telephone, AFTN or satellite telephone will be used as appropriate.

RESTORATION OF SERVICES

All affected facilities will be advised when oceanic control service at ATMC is fully or partially resumed.

CONTACTS

| Facility | Telephone Number | AFTN |
|-------------------|-------------------------|-------------|
| ATM Center | | RJJJZOX |
| ATM Supervisor | +81-92-608-8870 | |

CHAPTER 5: MAGADAN FIR

FIR WITH SUPPORTING PROCEDURES

None

GENERAL PROVISIONS

The air traffic flow in Magadan FIR Oceanic Sector is generally westbound. As a rule, air traffic from North America to Asia is conducted in the open airspace with light and changeable winds which helps operators to avoid jet streams in the North Pacific and use preferable and safe air routes. There is also eastbound traffic from Asia to North America from time to time. Eastbound and westbound aircraft proceed between fixes of Tiksi Area Control Centre (ACC) and Yakutsk ACC to certain fixes in Anchorage Arctic FIR. Magadan ACC is somewhat a junction between the two continental ACCs of Tiksi and Yakutsk and Anchorage Arctic FIR, where they don't change altitudes as a rule.

Communication in this area is handled with the help of several resources. Magadan ACC has high frequency (HF) transponders and receivers at its disposal, located in the vicinity of Magadan and Keperveem. Reports along 169W of the Magadan/Anchorage FIR boundary up to the Tiksi/Yakutsk FIR boundary are performed on Magadan Radio HF. Air traffic service within the Magadan FIR Oceanic Sector is also possible with the help of Communications, Navigation and Surveillance (CNS/ATM) using Automatic Dependent Surveillance-Contract (ADS-C) and controller pilot data link communications (CPDLC).

Air traffic within the Magadan ACC Oceanic Sector is observed with the help of ADS-C.

LEVELS of SERVICE

Limited service situations can be caused by:

- absence of enough personnel
- minor equipment failures
- failures in ancillary facilities

No service situations can be caused by:

- serious equipment failures
- equipment failures
- evacuation of facility's personnel

LIMITED SERVICE - PROCEDURES

Limited Communications

As Magadan ACC is sufficiently supplied with numerous sources of communication, one lost channel would not affect the quality of communication service in the Magadan FIR Oceanic Sector. In the case when one HF channel is lost, secondary HF frequencies shall be used to transmit messages providing regular communication. In addition, CNS/ATM (ADS-C/CPDLS) service is provided.

In case one lost channel. Anchorage Air Route Traffic Control Center (ARTCC), Murmansk ACC, Tiksi ACC and Yakutsk ACC will be notified and reports shall be transmitted on Magadan Radio secondary frequencies.

Anchorage ARTCC, Murmansk ACC, Tiksi ACC and Yakutsk ACC will also be notified in case it is necessary to use alternative high frequencies in certain areas. All the transmissions via Magadan Radio could be completed by Murmansk Radio.

Direct satellite voice communication is available up to 83N and is provided with the help of the INMARSAT Network. All aircraft equipped with Iridium are able to cover the area up to North Pole.

Limited ATS

In case of limited ATS, Magadan ACC Administration shall contact adjacent facilities with information on the limited services and provide information on certain restrictions. Users of the airspace shall be informed as early as practicable to have sufficient time for making decisions on tactical re-routes. All the daily routes and restrictions shall remain in force. The Magadan ATM Facility will coordinate with all the facilities involved to regulate the intensity of air flow and slots, if necessary.

NO SERVICE – PROCEDURES

Disruption of Ground/Air Communication Capability

In a situation when communications between the ACC and aircraft in the Magadan FIR Oceanic Sector are lost, all the aircraft shall maintain their current routes and altitudes until communication with another air navigation service provider (ANSP) is established, and maintain their last assigned airspeed or last assigned Mach number.

Anchorage ARTCC, Murmansk ACC, Tiksi ACC and Yakutsk ACC will be notified about the current situation and requested waypoints of different air routes for communication. Each facility shall inform all the aircraft in the area that communication with Magadan ACC is not currently available as well as providing the position and frequency to contact the adjacent facility. The Estimated Time of Arrival (ETA) to cross the FIR boundary will still be transmitted by Magadan ACC to all the facilities involved via standard and reserved available channels.

Transit aircraft flying through Magadan FIR Oceanic Sector should not expect limited service or airspace usage due to lost communication services.

Loss of Ability to Provide Control Services (Total Loss of Control)

In case of total loss of the ability of Magadan ACC to provide control services in the Oceanic FIR, Murmansk ACC, Anchorage ARTCC, Tiksi ACC and Yakutsk ACC will be informed immediately. All the aircraft in the air will be allowed to proceed via Magadan Oceanic Sector airspace. Anchorage ARTCC will be notified to report ETAs of aircraft crossing IRMAK, TIGLA and RUTIN direct to Tiksi ACC, and ETAs of aircraft crossing TURDI direct to Yakutsk ACC. Tiksi ACC will be notified to request ETAs of aircraft crossing NALIM, RAMEL, NIKIN and ORVIT from aircraft proceeding to Anchorage ARTCC airspace and report these data and altitudes. Anchorage ARTCC will be notified to request ETAs of aircraft entering Tiksi airspace

(TIGLA and RUTIN) and transfer it to Tiksi ACC, and Yakutsk airspace (TURDI) and transfer it to Yakutsk ACC. All aircraft on the ground shall stay on ground until they are able to plan their flights avoiding the affected area or after certain air traffic management (ATM) programs are introduced.

Loss of Communication between ATC Facilities

All the communication between ATC facilities shall be conducted via commercial telephones. See the commercial telephone numbers in **Appendix I-4-A**.

RESTORATION OF SERVICES

All the facilities involved will be notified when Magadan Oceanic Sector is able to restore air traffic control services totally or partially. In case Magadan Oceanic Sector is to restore control from a remote position, limited services will continue for an uncertain period of time.

CONTACTS – MAGADAN ACC

| ACC | Commercial Telephone Number | AFTN |
|----------------------------------|--|----------|
| Magadan ACC | 011-7-413-260-6719 | UXMMZRZX |
| Supervisor | 011-7-413-260-7180 | |
| INMARSAT from RUSSIA | (8-10)-870-762883369 | |
| INMARSAT from abroad (to RUSSIA) | 7-870-762883369 | |
| HF | 15030, 13265, 11390, 8837, 6585, 5550, 4712, 2884. | |
| Tiksi ACC | 011-7-411-672-8386 | UESTZRZX |
| Supervisor | 011-7-411-672-8500 | |
| VHF | 129,5 | |
| HF | 4712 | |
| Yakutsk ACC | 011-7-411-244-3127 | UEEEZRZX |
| Supervisor | | |
| VHF | 122,5 | |
| HF | 4712 | |
| Anchorage ARTCC (ZAN) | | PAZAZQZX |
| Shift Supervisor | 1-907- 269-1103 | |
| Watch Supervisor Sector 3 or 4 | 1-907-269-1915 | |
| Murmansk ACC | 011-7-815-228-1314 | ULMMZOZX |
| Supervisor | 011-7-815-228-1383 | |
| VHF | 126,9 | |
| HF | 11390, 8950, 5694, 4672 | |
| Edmonton ACC | 1-780-890-8397 | CZEGZQZX |
| Supervisor North-High | 1-780-890-4712 | |
| Gander-Radio | | CYQXYSYX |
| Shift Supervisor | 1-709-651-5222 | |
| HF | 2971, 4675, 8891, 11279 | |

CHAPTER 6: MURMANSK OCEANIC FIR

FIRs WITH SUPPORTING PROCEDURES

None

NOTIFICATION PROCEDURES

In a limited service situation, notification of service limitations will be promulgated to operators and adjacent ACCs by Notice to Airmen (NOTAM) as soon as practicable.

In a no service situation, when the ACC is likely to have been evacuated, a contingency message will be sent to operators and adjacent ACCs as soon as practicable by NOTAM. Adjacent ACCs additionally will be informed by phone.

LIMITED SERVICE PROCEDURES

Disruption of Ground/Air Capability

In case of Murmansk ACC high frequency (HF) failure it is possible to delegate HF service to Magadan ACC.

Disruption of Ability to Provide Control Service

Murmansk ACC will inform operators and adjacent ACCs on implemented limitations as soon as practicable. Traffic in possession of a valid oceanic clearance will have priority over any other traffic.

NO SERVICE PROCEDURES

Loss of Ground/Air Communication Capability

Communication service for pilots within Murmansk FIR will be delegated to Magadan ACC.

Loss of Ability to Provide Control Service

In case of loss of ability to provide control service, notification of duration and service termination reasons will be promulgated by Murmansk ACC to operators and adjacent ACCs as soon as practicable.

When notification is issued for a route change to detour around Murmansk FIR, all pilots already within or beyond Murmansk FIR that are unable to re-route shall maintain maximum watch and adhere strictly to the oceanic clearance given.

MURMANSK CONTACTS

| | | |
|--------------|--|----------------------------------|
| Murmansk ACC | +7-8152-281-314 (Oceanic Sector) +7-8152-281-318 (Continental Sector) | AFTN: ULMMZOZX AFTN: ULMMZRZX |
| HF | 4672KHz; 5694KHz; 8950KHz; 11390KHz | |
| Supervisor | +7-8152-281-383 | AFTN: ULMMZRZX |

CHAPTER 7: REYKJAVIK OCEANIC FIR/CTA

FIRs WITH SUPPORTING PROCEDURES

None

NOTIFICATION PROCEDURES

In a limited service situation, notification of any service limitations and traffic management measures will be promulgated to operators and adjacent air navigation service providers (ANSPs) by Notice to Airmen (NOTAM) normally not later than 12 hours prior to activation or as soon as practicable in case of an unexpected service interruption.

In a no service situation, the Oceanic Area Control Centre (OACC) is likely to have been evacuated. As soon as possible after evacuation a Contingency Message will be sent by NOTAM and Iceland radio will advise aircraft within Reykjavik FIR/CTA. Adjacent centres will be advised by phone.

LIMITED SERVICE - PROCEDURES

Disruption of Ground/Air Communication Capability

Iceland Radio and Shanwick Radio provide joint communications for the communications area comprising Reykjavik/Sondrestrom and Shanwick Oceanic Areas resulting in a virtual radio station for the North Atlantic from 45N to the North Pole. Radio Operators work flights in either area, updating both Reykjavik and Shanwick Control Centres. Joint Operations between Iceland Radio and Shanwick Radio increases the ability to provide a “normal” service with assistance from adjacent aeronautical stations.

Iceland Radio provides communication services using HF and general purpose VHF. Reykjavik OACC provides direct controller-pilot communication (DCPC) VHF communications in the South Sector and most of the East Sector. Reykjavik OACC and Iceland Radio are located in separate buildings several kilometers apart. Disruption at one facility is therefore unlikely to affect the other facility and each will therefore serve as a backup for the other in cases of limited disruption of ground/air communication capability.

In case of failure of Iceland Radio HF services, the HF service will be delegated to the radio stations in neighboring areas; Shanwick Radio, Gander Radio and Bodo Radio.

Disruption of Ability to Provide Control Services

Reykjavik OACC will determine, co-ordinate and promulgate any necessary restrictions to meet the service limitation. Traffic in possession of a valid oceanic clearance will have priority over any other traffic. En route re-clearance of such traffic will not be permitted except in emergency.

Traffic without a valid oceanic clearance may be subject to tactical traffic management measurements to meet the requirements of the service limitation.

Flight Planning

Flight plans shall be filed and addressed to Reykjavik OACC as well as to the appropriate adjacent ATS Units and Integrated Initial Flight Plan Processing System (IFPS), where applicable, in accordance with normal procedures.

Separation Standards

Reykjavik OACC will be responsible for ensuring the co-ordination and implementation of any additional separation requirements. In case of contingency track activation, there shall be at least 20 minutes separation between aircraft upon entry on the same contingency track and level.

Contingency Tracks

Dependant on the nature of the service limitation, Reykjavik OACC may promulgate and activate contingency tracks for use in addition to the North Atlantic Organized Track System (NAT OTS). The contingency route structure detailed in this section will in most cases be implemented.

Air Traffic Flow Management

Reykjavik OACC will co-ordinate any necessary traffic management measures where necessary with the EUROCONTROL Central Flow Management Unit (CFMU). Such measures may include, but are not limited to, temporary capacity restrictions and tactical re-routing measures.

Reykjavik OACC will co-ordinate these restrictions where necessary with adjacent ANSPs where they may affect the flow of traffic through these units airspace.

Communications

Aircraft shall not communicate directly with Reykjavik Oceanic Control on DCPC VHF except when instructed to do so or if in emergency. Position reporting within Reykjavik FIR/CTA will be with Iceland Radio or via Automatic Dependent Surveillance (ADS), controller pilot data link communication (CPDLC), or Flight Management Systems (FMS) in accordance with normal procedures. Aircraft unable to contact Iceland Radio on HF Frequency shall call one of the following stations:

Shanwick Radio
Bodø Radio
Gander Radio

Aircraft shall maintain continuous listening watch on the assigned frequencies.

Radar Service

Radar service will be provided at ATS discretion. Aircraft are required to maintain their assigned discrete Secondary Surveillance Radar (SSR) Code while within Reykjavik FIR/CTA.

Responsibilities of Adjacent ANSPs

The action required of adjacent ANSPs will vary dependant on the nature of the service limitation. Where such action is not contained within the inter-centre Letters of Agreement (LOAs) the requirement will be promulgated within the initial failure and restrictions message.

NO SERVICE - PROCEDURES

Loss of Ground/Air Communication Capability

Iceland Radio and Shanwick Radio provide joint communications for the communications area comprising Reykjavik/Sondrestrom and Shanwick Oceanic Areas resulting in a virtual radio station for the North Atlantic from 45N to the North Pole.

Radio Operators work flights in either area, updating both Reykjavik and Shanwick Control Centres. Joint Operations between Iceland Radio and Shanwick Radio increases the ability to provide a “normal” service with assistance from adjacent aeronautical stations.

Iceland Radio provides communication services using HF and general purpose VHF. Reykjavik OACC provides DCPC VHF communications in the South Sector and most of the East Sector. Reykjavik OACC and Iceland Radio are located in separate buildings several kilometers apart. Disruption at one facility is therefore unlikely to affect the other facility and each will therefore serve as a backup for the other in cases of limited disruption of ground/air communication capability.

In case of failure of Iceland Radio HF services, the HF service will be delegated to the radio stations in neighboring areas; Shanwick Radio, Gander Radio and Bodo Radio.

Loss of Ability to Provide Control Services

Should Reykjavik OACC be evacuated, the potential exists for a major disruption to ATC service within the Reykjavik Oceanic Control Area (OCA).

The HF and general purpose VHF radio communications facilities for the Reykjavik OACC are remotely located at the Iceland Radio facilities in another part of Reykjavik city, and will therefore unlikely be affected.

In the event that Reykjavik Air Traffic Control Center (ATCC) is evacuated, the operations will be moved to Iceland Radio and the provision of air traffic services (ATS) within the Reykjavik FIR/OCA will be continued at that location as far as practicable.

Telephone numbers at Iceland Radio for North and West sectors will be +354 563 6506 and for South and East sectors +354 563 6507.

As soon as possible after evacuation, a Contingency Message will be sent by NOTAM and Iceland Radio will advise aircraft within Reykjavik FIR/CTA. Adjacent centers will be advised by phone.

Contact information that may be used in the event of an emergency evacuation is provided.

Flight Planning

Flight plans shall be filed and addressed to Reykjavik Oceanic Area Control as well as to the appropriate adjacent ATS Units and IFPS, where applicable, in accordance with normal procedures.

Separation Standards

Reykjavik OACC will be responsible for ensuring the co-ordination and implementation of any additional separation requirements. In case of contingency track activation, there shall be at least 20 minutes separation between aircraft upon entry on the same contingency track and level.

Contingency Tracks

The contingency route structure detailed in this section will be implemented.

Air Traffic Flow Management

Reykjavik OACC will co-ordinate any necessary traffic management measures where necessary with the EUROCONTROL CFMU. Such measures may include, but are not limited to, complete closure of the airspace, temporary capacity restrictions and tactical re-routing measures.

Reykjavik OACC will co-ordinate these restrictions where necessary with adjacent ANSPs where they may affect the flow of traffic through these units airspace.

Communications

HF congestion is likely. Communications should be kept to a necessary minimum. Unnecessary routing, flight level and speed changes will not be issued.

Communications and Position reporting within Reykjavik FIR/CTA will be with Iceland Radio or via ADS/CPDLC/FMC. Aircraft unable to contact Iceland Radio on general purpose VHF or HF Frequency shall call one of the following stations:

Shanwick Radio
Bodø Radio
Gander Radio
Montreal radio

Aircraft shall maintain continuous listening watch on the assigned frequencies.

Radar Service

Radar service will not be provided. Aircraft are nevertheless required to maintain their assigned discrete SSR Code while within Reykjavik FIR/CTA.

Responsibilities of Adjacent ANSPs

Other ATSUs will provide guidance as far as possible in the circumstances.

FLIGHT CREW AND OPERATOR PROCEDURES

For Flights within the Reykjavik OCA

The procedures outlined below are to be used as guidance for pilots in the immediate aftermath of a sudden withdrawal of ATC services as described above.

On receipt of the Contingency Message, pilots are requested to broadcast to other flights on 121.5 and 123.45. A listening watch on these frequencies must be maintained.

Reykjavik OACC will endeavor to provide a limited ATC service through Iceland Radio as soon as possible after evacuation commences.

Flights operating with a received and acknowledged oceanic clearance will be expected to continue in accordance with the last clearance issued unless otherwise advised by ATC. Aircrew shall use extreme caution and use all available means to detect any conflicting traffic.

Flights should remain in or establish communications with Iceland Radio. Flights unable to contact Iceland Radio should establish communication with the next agency at the earliest opportunity stating current position, cleared flight level, next position and estimate and subsequent position. This also applies to flights using automatic position reports (ADS/CPDLC/FMC) as these reports may not have been received by the next agency.

When flights making automatic position reports are notified of a Reykjavik OACC evacuation, they must revert to voice position reporting until clear of Reykjavik OCA, or notified otherwise. Pilots of FANS1/A equipped flights should note that they may be asked to log on to the next agency while within the Reykjavik OCA. They should not initiate this action until instructed to do so.

If unable to establish radio contact, flights may use SATCOM voice or satellite telephone to provide position reports.

| Oceanic Centre | Gander | Santa Maria | New York | Ballygirreen (Shanwick Aeradio) |
|---------------------------------------|--------------------|--|--------------------|--|
| Telephone Number | +1 709 651 5207 | +351 296 820 438 +351 296 886 042 (satellite link) | +1 631 468 1413 | +353 61 471 199 |
| SATCOM INMARSAT Short Code | 431613 | 426305 | 436623 | 425002 |

Flights may request their flight dispatch offices to forward position reports if sending position reports to multiple ATS Units or if otherwise unable to forward position reports.

For Flights Approaching the Reykjavik OCA when the Contingency is Activated Not in Receipt of an Oceanic Clearance

In the event that Reykjavik OACC must be evacuated, only aircraft with received and acknowledged oceanic clearances are permitted to transit Reykjavik OCA.

If unable to obtain or acknowledge an oceanic clearance, flights shall re-route around the Reykjavik OCA or land at an appropriate airfield. The adjacent areas will issue advice on procedures to be followed.

For Flights Approaching the Reykjavik OCA when the Contingency is Activated in receipt of an Acknowledged Oceanic Clearance

Aircraft operating with a received and acknowledged oceanic clearance may, at pilot's discretion, continue, but must expect a limited ATC service within the Reykjavik OCA. Aircrew shall use extreme caution and use all available means to detect any conflicting traffic. Due to the remote location of the HF service provider communications will be available through Iceland Radio.

However, due to the uncertainty surrounding the contingency situation pilots are strongly advised to comply with the procedures detailed above for flights not in receipt of an oceanic clearance even if they are in receipt of an acknowledged oceanic clearance.

REYKJAVIK OACC – CONTINGENCY ROUTE STRUCTURE

For Activation within Reykjavik OCA

In a limited service contingency situation, Reykjavik OACC may promulgate contingency tracks in addition to the published NAT OTS. A set of routes, titled ICECON Tracks, have been established for this purpose. Promulgation of the tracks will be via Aeronautical Fixed Telecommunications Network (AFTN).

It is mandatory to flight plan on the ICECON tracks during the periods detailed below. The contingency tracks must be flight planned as if they were random route tracks (detailing each waypoint in the flight plan).

IT IS ESSENTIAL FOR AVIATION SAFETY THAT ALL PILOTS UNDERSTAND AND COMPLY WITH THE PROVISIONS OF THIS CONTINGENCY PLAN.

Flight level changes for en-route aircraft should not be expected within Reykjavik FIR/CTA.

Random flights at directional levels will be accepted at FL 290 and below, as well as FL 410 and above, however, flow restrictions may be imposed.

Radar service will be provided at ATS discretion.

Ambulance and Search and Rescue flights will be dealt with on individual bases.

Day Tracks

The following DAY TRACKS will be effective on entry into Reykjavik FIR/CTA from 0930 to 1800 except A, B and C, which will be activated as part of the NAT OTS.

A BARKU - RATSU - 63N020W - 64N030W - 64N040W - 63N050W - 61N060W –
MIBNO - RODBO
Westbound FL340/350/360
Eastbound FL380

B ATSIX - 62N020W - 63N030W - 63N040W - 62N050W - 60N060W – PEPKI - LOPVI
Westbound FL340/350/360/370/380/390
Eastbound NIL

C BALIX - 61N020W - 62N030W - 62N040W - 61N050W – MOATT - LOMTA
Westbound FL340/350/360/370/380/390
Eastbound NIL

ICECON 8 BESGA - MATIK - 62N010W - 64N020W - 66N030W - 67N040W - 67N050W
- DARUB
Westbound FL340/350/360
Eastbound FL390

ICECON 10 GONUT - 63N010W - 65N020W - 67N030W - 69N040W - 70N050W -
70N060W - ADSAM
Westbound FL340/350/360
Eastbound FL370/380/390

ICECON 14 LIRKI - 66N005W - 71N010W - 7630N020W - 81N040W - ALERT
Westbound FL340/350/360
Eastbound NIL

ICECON 16 73N00W - 79N010W – 82N020W - PELRI
Westbound FL340/350/360
Eastbound FL310

ICECON 18 80N00W - 85N020W - OVBES
Westbound FL340/350/360
Eastbound FL310

ICECON 20 EXITA - 78N020W - 7830N040W - THT - LENIM
Westbound FL320/330
Eastbound FL370/380

ICECON 22 IPTON - 63N010W - 63N020W - 64N030W - 64N040W - 63N050W -
61N060W – MIBNO – RODBO
Westbound FL330
Eastbound NIL

ICECON 24 GUNPA - 62N010W - 62N020W - 63N030W - 63N040W - 62N050W -
60N060W – PEPKI – LOPVI
Westbound FL330
Eastbound NIL

ICECON 24A GUNPA - 62N010W - 62N020W - 62N030W - 62N040W - 61N050W –
MOATT – LOMTA
Westbound FL330
Eastbound NIL

Contingency day tracks effective on entry into Reykjavik FIR/CTA from 0930 to 1800 except A, B and C, which will be activated as part of the NAT OTS. Refer to the text above for flight level allocation on the tracks.

Night Tracks

NIGHT TRACKS will be effective on entry into Reykjavik FIR/CTA from 2300 to 0600 except ICECON 11 and 13 which will become effective from 0100 until 0600 at 30W.

ICECON 7 ADSAM - 70N060W - 70N050W - 69N040W - 67N030W - 65N020W -
63N010W - GONUT
Eastbound FL340/350
Westbound FL330

ICECON 9 DARUB - 67N050W - 66N040W - 65N030W - 64N020W - 62N010W –
MATIK - BESGA
Eastbound FL340/350
Westbound FL330

ICECON 11 62N040W - 63N030W - KEF - 64N020W - 63N010W -IPTON
Eastbound FL360/370/380
Westbound NIL

ICECON 13 61N040W - 62N030W - 62N020W - 62N010W - GUNPA
Eastbound FL360/370/380
Westbound NIL

ICECON 13A 61N040W - 62N030W - 62N020W - RATSU - BARKU
Eastbound FL360/370/380
Westbound NIL

ICECON 15 ALERT- 81N040W - 7630N020W - 71N010W - 66N005W - LIRKI
Eastbound FL350/390
Westbound FL340

ICECON 17 PELRI - 82N020W - 79N010W – 73N000W
Eastbound FL350/360/370
Westbound FL310/340

ICECON 19 OVBES - 85N020W – 80N000W
Eastbound FL350/360/370
Westbound FL310/340

ICECON 21 LENIM - THT - 7830N040W - 78N020W - EXITA
Eastbound FL330/380
Westbound FL320

Eastbound traffic will not be permitted to route from Shanwick or Scottish airspace into Reykjavik airspace unless at FL 270 and below or FL 390 and above.

Contingency night tracks effective on entry into Reykjavik FIR/CTA from 2300 to 0600 except ICECON 11 and 13 which will become effective from 0100 until 0600 at 30W. Refer to the text above for flight level allocation on the tracks.

Tracks Available 24 Hours

Iceland - Inbound and Outbound

INBOUND

RATSU - ALDAN - KEF
Westbound FL320

GUNPA - 63N010W - ING - KEF
Westbound FL 310
61N040W - 62N030W - DROMI
Eastbound FL 290/310

BIAR – IPTON 64N010W ES AKI

BIEG – IPTON 64n010W ES
Westbound FL300

OUTBOUND

KEF - BREKI - RATSU- BARKU
Eastbound FL 310 - To be level by BREKI
Radial 098 until FL 320 - 63N010W - GUNPA

KEF - EMBLA - 63N030W – 62N040W
Westbound FL 320

BIAR – AKI ES 64N010W IPTON

BIEG – ES 64N010W IPTON
Eastbound FL290

Faeroes Islands - Inbound and Outbound

INBOUND

VALDI - BUREM
Westbound FL 280

OUTBOUND

G11 - GONUT
Eastbound FL 290

Sondrestrom - Inbound and Outbound

INBOUND

ICECON 12 IPTON - 64N010W - 66N020W - 67N030W - 67N040W - 67N050W - SF
Westbound FL 310

EPMAN - SF
Eastbound FL 300

6000N05630W - KU - SF
Northbound FL 320

SAVIS - TOMAS - UP - DISGU - SF
Southbound FL 320

OUTBOUND

ICECON 12 67N050W - 67N040W - 67N030W - 66N020W - 64N010W - IPTON
Eastbound FL 320

EPMAN
Westbound FL 320

KU - 6000N05630W - PRAWN
Southbound FL 310

DISGU - UP - TOMAS - SAVIS - THT
Northbound FL 310
Radar service will be provided by ATC Sondrestrom.

Thule - Inbound and Outbound

INBOUND

DISGU - UP - TOMAS - SAVIS - THT
Northbound FL 310

JULET - LIPSI - THT

ALL LEVELS to LIPSI, after LIPSI FL290 at or below

OUTBOUND

SAVIS - TOMAS - DISGU - SF

Southbound FL 320, not ABV FL 310 until after SAVIS

LIPSI - JULET

ALL LEVELS, not ABV FL 310 until after LIPSI

Radar service will be provided by Thule RAPCON.

Traffic via ABERI

CANEL 73N060W 79N055W 84N040W ABERI

Eastbound FL300

Westbound NIL

Contingency tracks available 24 hours. Refer to the text above for flight level allocation on the tracks.

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EVACUATION MESSAGES - REYKJAVIK OACC

AFTN

DD BGGLZQZX BGSFYFYX CYQXYFYX CZEGZQZI CZQXZQZX
EGGXZQZX EGPXZQZX EIAAYFYX ENOBZQZX
XXXXXX BICCYFYX

SVC

Reykjavík Centre has been evacuated, personnel is on its way to BICC.
Telephone numbers: +354 568 4600, +354 568 4601.

ICELAND RADIO ON VOICE

“EMERGENCY EVACUATION OF REYKJAVIK CENTRE IS IN PROGRESS. NO AIR TRAFFIC CONTROL SERVICE WILL BE PROVIDED BY REYKJAVIK. USE EXTREME CAUTION AND MONITOR THIS FREQUENCY, EMERGENCY FREQUENCIES AND AIR TO AIR FREQUENCIES.”

PART III - CONTINGENCY SITUATIONS AFFECTING MULTIPLE FIRs

VOLCANIC ASH CONTINGENCIES

Within and adjacent to the North Atlantic (NAT) and European (EUR) Regions there are areas of volcanic activity which are likely to affect flight in the NAT and EUR Regions. The *Volcanic Ash Contingency Plan - EUR and NAT Regions* (EUR Doc 019/NAT Doc 006, Part II) at **Appendix A** sets out standardised guidelines for the alerting of aircraft when eruptions occur, and procedures to be followed for these regions. These procedures may also be useful for application in Arctic airspace.

- END -

EUR Doc 019
NAT Doc 006, Part II

INTERNATIONAL CIVIL AVIATION ORGANIZATION



VOLCANIC ASH CONTINGENCY PLAN
-
EUR AND NAT REGIONS

December 2010

THIS DOCUMENT IS ISSUED BY THE EUR/NAT OFFICE OF ICAO
UNDER THE AUTHORITY OF THE EANPG AND THE NAT SPG

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FOREWORD

Within and adjacent to the North Atlantic (NAT) and European (EUR) Regions there are areas of volcanic activity which are likely to affect flight in the NAT and EUR Regions. This plan sets out standardised guidelines for the alerting of aircraft when eruptions occur, and procedures to be followed.

Volcanic ash may be a hazard for flight operations. Recent encounters with volcanic ash have resulted in one or more of the following and other problems:

- Engine failures and malfunctions
- Subsequent failure of electrical, pneumatical and hydraulic systems
- Blocking of sensors, resulting inter alia in erroneous airspeed indications
- Smoke, dust and/or chemical pollution of cabin air; resulting in the need for aircrews to use oxygen masks
- Communication problems
- Loss of visibility through cockpit windows

Regulatory authorities of State of the Operator¹, or State of Registry² as appropriate, should therefore prescribe appropriate operational procedures for flight crew to be followed in case of operation in or near airspaces that are contaminated by volcanic ash. Operators are required by ICAO Annex 6 to assess the risk of operation in volcanic ash and to implement appropriate mitigation measures in accordance with their Safety Management System as approved by the State of the Operator/Registry as appropriate.

It should be noted that this document is an Air Traffic Management (ATM) contingency plan including its interfaces with supporting services such as Aeronautical Information Service (AIS) and Meteorological (MET) and that the Plan therefore primarily addresses the Provider States³. Where distinct actions by the Meteorological Watch Offices (MWOs) are described, these are additional procedures to be considered by MWOs. Where actions by Volcanic Ash Advisory Centres (VAACs) and operators are described, these are for clarification only.

Volcanic Ash can also affect the operation of aircraft on aerodromes. In extreme cases, aerodromes might no longer be available for operation at all, resulting in repercussions on the ATM system; e.g. diversions, revised traffic flows, etc.

These suggested procedures are not intended to establish or confirm a safe level of ash concentration. Values have been agreed to depict an area of ash concentration as low, medium or high. Operation through any area where volcanic ash is forecast is at the discretion of the operator.

NOTE All modeled ash concentrations are subject to a level of uncertainty relative to errors in the estimation of the eruption strength.

¹ The term “State of the Operator” refers to the role of a Contracting State as the regulatory authority with regard to aircraft operators having been issued an Aircraft Operator’s Certificate (AOC) by that State.

² The term “State of Registry” refers to the State on whose register the aircraft is entered.

³ The term “Provider State” refers to the role of a Contracting State as responsible for the provision of air navigation services within airspace over its territory and, as agreed by Regional Air Navigation Meeting, within defined airspace over the High Seas.

Volcanic Ash Contingency Plan – EUR and NAT Regions

Considering that a commercial aircraft will travel about 150 km (80 NM) in 10 minutes and that volcanic ash can rise to flight levels commonly used by turbine-engine aeroplanes in half that time, timely response to reports of volcanic ash is essential.

It is imperative that information on the volcanic activity is disseminated as soon as possible. In order to assist staff in expediting the process of originating and issuing relevant messages (SIGMET, NOTAM, and ASHTAM), a series of templates should be available for different stages of the volcanic activity. Examples of SIGMET, NOTAM and ASHTAM announcing operational measures and volcanic activities in the different stages and are contained in Appendix I. ASHTAM will not be promulgated by service providers in the NAT Region.

A list of ICAO registered volcanoes should be available at the international NOTAM office with volcano name, number and nominal position.

In order to ensure the smooth implementation of the Contingency Plan in case of an actual volcanic eruption, annual VOLCEX exercises should be conducted.

Terminology

Area of Low Contamination: An airspace of defined dimensions where volcanic ash may be encountered at concentrations equal to or less than $2 \times 10^{-3} \text{ g/m}^3$.

Area of Medium Contamination: An airspace of defined dimensions where volcanic ash may be encountered at concentrations greater than $2 \times 10^{-3} \text{ g/m}^3$, but less than $4 \times 10^{-3} \text{ g/m}^3$.

Area of High Contamination: An airspace of defined dimensions where volcanic ash may be encountered at concentrations equal to or greater than $4 \times 10^{-3} \text{ g/m}^3$, or areas of contaminated airspace where no ash concentration guidance is available.

It should be noted that “defined dimensions” refers to horizontal and vertical limits.

The response to a volcanic event that affects air traffic has been divided into three distinct phases as described briefly below. Volcanic activity at many locations is continuously monitored by the scientific community. Furthermore, flight crew are required to report observations of significant volcanic activity by means of a Special Air Report (AIREP). Arrangements are in place to ensure that such information is transferred without undue delay to the appropriate aeronautical institutions responsible for subsequent action.

ALERTING PHASE The initial response, “raising the alert”, commences when a volcanic eruption is expected. Alerting information will be provided by SIGMET, NOTAM or ASHTAM as appropriate and disseminated to affected aircraft in flight by the most expeditious means. In addition to the normal distribution list, the NOTAM/ASHTAM will be addressed to meteorological/volcanological agencies.

If it is considered that the event could pose a hazard to aviation, a Danger Area⁴ will be declared by NOTAM around the volcanic source. Normally, clearances will not be issued through the Danger Area.

⁴ Wherever this document discusses the possible establishment of Danger Areas, States are not prevented from establishing Restricted or Prohibited Areas over the sovereign territory of the State if considered necessary by the State concerned.

Volcanic Ash Contingency Plan – EUR and NAT Regions

- REACTIVE PHASE** The Reactive Phase commences at the outbreak of the volcanic eruption and entrance of volcanic ash into the atmosphere and mainly pertains to aircraft in flight. A “Start of Eruption SIGMET” will be issued and a Danger Area will be declared by NOTAM. Normally, clearances will not be issued through the Danger Area.
- PROACTIVE PHASE** The Proactive Phase commences with the issuance of the first Volcanic Ash Advisory (VAA) and Volcanic Ash Graphic (VAG) after completion of reactive responses. Supplementary modelled ash concentration charts may be available. The volcanic ash forecasts up to T+18 hours are to be used to prepare SIGMET. SIGMET shall be issued as soon as practicable but not more than 12 hours before the commencement of the period of validity, and shall be valid for up to 6 hours. The T+12 hours and T+18 hours (and further into the future, if available) volcanic ash forecasts are to be used to prepare NOTAM/ASHTAM. Significant changes may result in a reversion to a temporary Reactive Phase situation and unscheduled issuance of VAA, VAG and ash concentration charts, SIGMET and NOTAM/ASHTAM. As appropriate, Danger Areas will be notified via NOTAM.

Note that where SIGMET and NOTAM are mentioned in this document, volcanic ash SIGMET and volcanic ash NOTAM are being referred to.

This document pays due respect to Standards and Recommended Practices in ICAO Annexes, WMO procedures, and guidance material contained in ICAO documents, including, but not limited to, the following:

ICAO Annex 3 – *Meteorological Services for International Air Navigation*; ICAO Annex 11 – *Air Traffic Services*; ICAO Annex 15 - *Aeronautical Information Services*; ICAO Doc 4444 – *Procedures for Air Navigation Services – Air Traffic Management*; ICAO Doc 8126 – *Aeronautical Information Services Manual*; ICAO Doc 8896 – *Manual of Aeronautical Meteorological Practice*; ICAO Doc 9691 – *Manual on Volcanic Ash, Radioactive Material and Toxic Chemical Clouds*; ICAO Doc 9766 – *Handbook on the International Airways Volcanic Watch*; ICAO Doc 9859 – *Safety Management Manual*; ICAO EUR Doc 014 – *EUR SIGMET and AIRMET Guide*; and WMO No.386 Volume I (*Manual of Global Telecommunications System*) Part II (*Operational Procedures for the Global Telecommunications System*).

1. ALERTING PHASE

1.1 This phase is characterised by a limited availability of information on the extent and severity of the volcanic event. The purpose of this phase is to ensure the safety of aircraft in flight and to promulgate information as a matter of urgency. Regardless of the extent of information available the Alerting Phase actions should be carried out for every event.

1.2 ORIGINATING ACC ACTIONS (eruption in its own flight information region)

1.2.1 In the event of significant pre-eruption volcanic activity, a volcanic eruption occurring, or a volcanic ash cloud being reported which could pose a hazard to aviation, an Area Control Centre (ACC), on receiving information of such an occurrence, should carry out the following:

- a) Define an initial Danger Area in accordance with established procedures. If no such procedures have been established, the danger area should be defined as a circle with a radius of 222 km (120 NM). If the eruption has not commenced or if no information on upper winds is available, the circle should be centred on the estimated location of the volcanic activity. If the eruption has started and predicted upper wind information is available, the circle should be centred 111 km (60 NM) downwind from the volcano whilst enclosing it. The purpose of this initial Danger Area is to ensure safety of flight in the absence of any prediction from a competent authority of the extent of contamination.
- b) Advise the associated Meteorological Watch Office (MWO) and the appropriate VAAC (unless the initial notification originated from either of these entities). The VAAC will then inform the appropriate Air Traffic Flow Management (ATFM) units.
- c) Alert flights already within the Danger Area and offer assistance to enable aircraft to exit the area in the most expeditious and appropriate manner. Aircraft that are close to the Danger Area should be offered assistance to keep clear of the area. Tactically re-clear flights which would penetrate the Danger Area onto routes that will keep them clear. The ACC should immediately notify other affected ACC's of the event and the location and dimensions of the Danger Area. It should also negotiate any re-routings necessary for flights already coordinated but still within adjacent flight information regions (FIRs). It is also expected that adjacent ACCs will be asked to reroute flights not yet coordinated to keep them clear of the Danger Area.
- d) Ensure that a NOTAM/ASHTAM is originated. This must provide as precise information as is available regarding the activity of the volcano. The name (where applicable), reference number and position of the volcano should be included along with the date and time of the start of the eruption (if appropriate). It is imperative that this information is issued by the international NOTAM office and disseminated as soon as possible.
- e) In order to assist staff in expediting the process of composing the NOTAM/ASHTAM, a series of templates should be available for this stage of the volcanic activity. Example NOTAM and ASHTAM are provided in Appendix I.

1.2.2 In addition to sending the NOTAM/ASHTAM and any subsequent NOTAM/ASHTAM to the normal distribution list, it will be sent to the relevant

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meteorological agencies after adding the appropriate World Meteorological Organisation (WMO) header. Example NOTAM and ASHTAM are provided in Appendix I.

1.3 ADJACENT ACC ACTIONS

1.3.1 During the Alerting Phase aircraft should be tactically rerouted to avoid the Danger Area. Any ash contamination should be contained within a limited area and disruption to traffic should not be excessive. Adjacent ACCs should take the following action to assist:

- a) When advised, re-clear flights to which services are being provided and which will be affected by the Danger Area.
- b) Unless otherwise instructed, continue normal operations except:
 - i) if one or more routes are affected by the Danger Area, stop clearing aircraft on these routes and take steps to reroute onto routes clear of the Danger Area; and
 - ii) initiate a running plot of the affected area.

1.4 ATFM UNIT ACTION

1.4.1 The ATFM unit and the VAAC will determine how their initial communications will take place on the basis of bilateral agreements. Upon reception of preliminary information on volcanic activity from the VAAC, the ATFM unit should initiate actions in accordance with its procedures to ensure exchange of information between Air Navigation Service Providers (ANSP), MWOs, VAACs and aircraft operators concerned.

2. REACTIVE PHASE

2.1 This phase commences at the outbreak of volcanic eruption. Major activities of the Reactive Phase are: Issuance of an eruption commenced SIGMET, eruption commenced NOTAM/ASHTAM and rerouting of airborne traffic. As appropriate, Danger Areas will be notified via NOTAM. This phase will last until such time as the Proactive Phase can be activated.

2.2 ORIGINATING ACC ACTIONS (eruption in its own FIR)

2.2.1 The ACC providing services in the FIR within which the volcanic eruption takes place should inform flights about the existence, extent and forecast movement of volcanic ash and provide information useful for the safe conduct of flights.

2.2.2 Rerouting of traffic commences immediately or may be in progress if the alerting time has been sufficient to facilitate activation of the Alerting Phase. The ACC should assist in rerouting aircraft around the Danger Area as expeditiously as possible. Adjacent ACCs should also take the Danger Area into account and give similar assistance to aircraft as early as possible.

2.2.3 During this phase the ACC should:

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- a) Maintain close liaison with its associated MWO. The MWO should issue a SIGMET message on the extent and forecast movement of the ash cloud based on appropriate sources of information.
- b) Based on these forecasts and in cooperation with the adjacent ACCs, ATFM measures should be devised and updated when necessary to enable aircraft to remain clear of Danger Areas.
- c) Ensure a NOTAM is originated to define a Danger Area.
- d) Ensure that reported differences between published information and observations (pilot reports, airborne measurements, etc.) are forwarded as soon as possible to the appropriate authorities.
- e) Should significant reductions in intensity of volcanic activity take place during this phase and the airspace no longer is contaminated by volcanic ash, a NOTAMC cancelling the last active NOTAM shall be issued stating the cause for cancellation; new ASHTAM should be promulgated to update the situation. Otherwise, begin planning for the Proactive Phase in conjunction with the appropriate ATFM unit and the affected ACCs.

2.3 ADJACENT ACC ACTIONS

2.3.1 During the Reactive Phase adjacent ACCs should take the following actions:

- a) Maintain close liaison with the appropriate ATFM unit and the originating ACC to design, implement and keep up to date ATFM measures which will enable aircraft to remain clear of Danger Areas.
- b) In the event that tactical measures additional to those issued by the appropriate ATFM unit are required, the adjacent ACC should, in cooperation with the originating ACC, impose such measures. Details are included in the ATFM Procedures section of this document.
- c) Maintain a running plot of the affected area.
- d) Begin planning for the Proactive Phase in conjunction with the appropriate ATFM unit and ACCs concerned.

2.4 ATFM UNIT ACTIONS

2.4.1 During the Reactive Phase, depending on the impact of the volcanic ash, the appropriate ATFM unit should organise the exchange of latest information on the developments with the VAAC, ANSPs, and MWOs and operators concerned.

3. PROACTIVE PHASE

3.1 The Proactive Phase commences with the issuance of the first VAA/VAG by the VAAC after completion of the reactive responses. The VAA/VAG will contain forecasts of the expected vertical and horizontal extent of the volcanic ash cloud, and its expected movement, at six-hourly time-steps for the period T+0 to T+18 hours. In addition, the meteorological office co-located with the VAAC will, where feasible, issue ash concentration forecasts to supplement the VAA/VAG information, at six-hourly intervals with a nominal validity time of 0000Z, 0600Z, 1200Z and 1800Z which will define Areas of Low, Medium and High Contamination.

3.2 Following the Reactive Phase, the VAA/VAG and (where available) ash concentration forecasts should be used to define airspace volumes encompassing the furthest extent of contamination predicted for that period. These volumes should be used to:

- a) Publish NOTAM indicating the extent of Danger Areas, indicating which areas of contamination are included therein;
- b) Issue SIGMET warning of potential hazard from areas of volcanic ash contamination;
- c) Publish NOTAM to separately indicate the extent of Areas of Medium Contamination if not included in a Danger Area; and
- d) Apply appropriate ATFM measures.

3.3 Longer term forecasts (i.e. beyond T+6 hours) should be used to generate NOTAM in order to ensure that adequate information is available to support flight planning. These messages should differentiate between levels of contamination.

3.4 Operators should use the information published regarding Areas of Low, Medium and High Contamination to plan their flights in accordance with their regulatory requirements and the service that will be provided in the airspace concerned. Operators should be aware that, depending on the State concerned, Danger Areas may be established to contain an Area of High Contamination, Areas of Medium/High Contamination, or Areas of Low/Medium/High Contamination.

3.5 The volcanic ash may affect any combination of airspace; therefore, it is impossible to prescribe measures to be taken for any particular situation. Nor is it possible to detail the actions to be taken by any particular ACC. The following guidance may prove useful during the Proactive Phase but should not be considered mandatory:

- a) ACCs affected by the movement of the ash should ensure that NOTAM/ASHTAM continue to be originated at appropriate intervals. ACCs concerned and the appropriate ATFM unit should continue to publish details on measures taken.
- b) Depending on the impact of the volcanic ash, the appropriate ATFM unit may take the initiative to organise teleconferences to exchange latest information on the developments with the VAACs, ANSPs and MWO's and operators concerned.
- c) During this phase the VAAC should endeavour to assess the vertical extent of the ash contamination and provide appropriate VAA/VAG to define the contaminated airspace as accurately as possible. For the purpose of flight

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planning, operators should treat the horizontal and vertical limits of the Danger Area to be over-flown as they would mountainous terrain. Operators are cautioned regarding the risk of cabin depressurisation or engine failure resulting in the inability to maintain level flight above the Danger Area, especially where Extended Twin Operations (ETOPS) aircraft are involved.

- d) Any reported differences between published information and observations (pilot reports, airborne measurements, etc.) should be forwarded as soon as possible to the appropriate authorities; and
- e) When the airspace is no longer contaminated by volcanic ash, a NOTAMC cancelling the active NOTAM shall be promulgated. New ASHTAM should be promulgated to update the situation.

4. ATFM PROCEDURES

4.1 Depending on the impact of the volcanic ash, the appropriate ATFM unit should organize the exchange of latest information on the developments with the VAACs, ANSPs and MWOs and operators concerned.

4.2 The ATFM unit will apply ATFM measures on request of the ANSPs concerned. The measures should be reviewed and updated in accordance with updated information. Operators should also be advised to maintain watch for NOTAM/ASHTAM and SIGMET for the area.

NOTE Procedures applicable to the EUROCONTROL Central Flow Management Unit (CFMU) area of responsibility are contained in the EUROCONTROL – Basic CFMU Handbook. This document is available at http://www.cfm.eurocontrol.int/cfm/public/standard_page/library_index.html

5. AIR TRAFFIC CONTROL PROCEDURES⁵

5.1 If volcanic ash is reported or forecast in the FIR for which the ACC is responsible, the following procedures should be followed:

- a) Relay all available information immediately to pilots whose aircraft could be affected to ensure that they are aware of the horizontal and vertical extent of the ash contamination;
- b) If requested, suggest appropriate rerouting to assist flights to avoid areas of known or forecast ash contamination;

⁵ This information is adapted from the *Manual on Volcanic Ash, Radioactive Material and Toxic Chemical Clouds* (Doc 9691). Refer to this document for full details.

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- c) When appropriate, remind pilots that volcanic ash may not be detected by ATC radar systems;
- d) If modelled ash concentration charts are available showing Areas of Low, Medium and High Contamination, the Provider State may establish Danger Areas. Depending on the State concerned, the Danger Areas will be established to contain an Area of High Contamination, Areas of Medium/High Contamination, or Areas of Low/Medium/High Contamination;
- e) In the absence of ash concentration guidance, the entire area of forecast volcanic ash should be considered as an Area of High Contamination, for the purposes of applying ATC procedures, until ash concentration guidance is available;
- f) Normally, ATC should not provide a clearance for an aircraft to enter or operate within a Danger Area. Assistance to enable an aircraft to exit a Danger Area in the most expeditious and appropriate manner should be provided;
- g) In the NAT Region, so far as practicable, Organized Tracks will not be established through a Danger Area. If Organized Tracks are established through contaminated areas, a note will be included on the NAT Track Message to identify such tracks; and
- h) If the ACC has been advised by an aircraft that it has entered an area of ash contamination and indicates that a distress situation exists:
 - i) consider the aircraft to be in an emergency situation;
 - ii) do not initiate any climb clearances to turbine-powered aircraft until the aircraft has exited the area of ash contamination; and
 - iii) do not attempt to provide vectors without pilot concurrence.

5.2 Experience has shown that the recommended escape manoeuvre for an aircraft which has encountered volcanic ash is to reverse its course and begin a descent (if terrain permits). However, the final responsibility for this decision rests with the pilot.

6. GENERAL GUIDANCE FOR THE DEVELOPMENT OF ATS CONTINGENCY PLANS FOR VOLCANIC ASH⁶

6.1 In a contingency plan relating to volcanic ash certain steps need to be taken to provide a coordinated and controlled response for dealing with an event of this nature. Responsibilities should be clearly defined for the manager in charge, supervisors and Air Traffic Controllers (ATCOs). The plan should also identify the officials who need to be contacted, the type of messages that are to be created, the proper distribution of the messages and how to conduct business.

6.2 ATCOs need to be trained and be made aware of the potential effects if aircraft encounter unsafe levels of volcanic ash.

6.3 Some particular points of guidance are as follows:

⁶ This information is adapted from the *Manual on Volcanic Ash, Radioactive Material and Toxic Chemical Clouds* (Doc 9691). Refer to this document for full details.

Volcanic Ash Contingency Plan – EUR and NAT Regions

- a) Volcanic ash contamination may extend for hundreds of miles horizontally and reach the stratosphere vertically
- b) Volcanic ash may block the pitot-static system of an aircraft, resulting in unreliable airspeed indications;
- c) Braking conditions at airports where volcanic ash has recently been deposited on the runway will affect the braking ability of the aircraft. This is more pronounced on runways contaminated with wet ash. Pilots and ATCOs should be aware of the consequences of volcanic ash being ingested into the engines during landing and taxiing. For departure it is recommended that pilots avoid operating in visible airborne ash; instead they should allow sufficient time for the particles to settle before initiating a take-off roll, in order to avoid ingestion of ash particles into the engine. In addition, the movement area to be used should be carefully swept before any engine is started;
- d) Volcanic ash may result in the failure or power loss of one or all engines of an aeroplane; and
- e) Airports might have to be declared unsafe for flight operations. This might have consequences for the ATM system.

6.4 The ACC in conjunction with ATFM units serves as the critical communication link between the pilot, dispatcher and meteorologists during a volcanic eruption. During episodes of volcanic ash contamination within the FIR, the ACC has two major communication roles. First and of greatest importance is its ability to communicate directly with aircraft en route which may encounter the ash. Based on the information provided in the volcanic ash SIGMET and VAAs and working with MWO, the ATCOs should be able to advise the pilot of which flight levels are affected by the ash and the projected trajectory and drift of the contamination. Through the use of radio communication, ACCs have the capability to coordinate with the pilot alternative routes which would keep the aircraft away from the volcanic ash.

6.5 Similarly, through the origination of a NOTAM/ASHTAM for volcanic activity the ACC can disseminate information on the status and activity of a volcano even for pre-eruption increases in volcanic activity. NOTAM/ASHTAM and SIGMET together with AIREPs are critical to dispatchers for flight planning purposes. Operators need as much advance notification as possible on the status of a volcano for strategic planning of flights and the safety of the flying public. Dispatchers need to be in communication with pilots en route so that a coordinated decision can be made between the pilot, the dispatcher and ATC regarding alternative routes that are available. The ACC should advise the ATFM unit concerning the availability of alternative routes. It cannot be presumed, however, that an aircraft which is projected to encounter ash will be provided with the most desirable route to avoid the contamination. Other considerations have to be taken into account such as existing traffic levels on other routes and the amount of fuel reserve available for flights which may have to be diverted to other routes to allow for the affected aircraft to divert.

6.6 The NOTAM/ASHTAM for volcanic activity provide information on the status of activity of a volcano when a change in its activity is, or is expected to be, of operational significance. They are originated by the ACC and issued through the respective international NOTAM office based on the information received from any one of the observing sources and/or advisory information provided by the associated VAAC. In addition to providing the status of activity of a volcano, the NOTAM/ASHTAM also provides information on the location, extent and movement of the ash contamination and the air routes and flight levels affected. NOTAM can also be used to limit access to the airspace affected by the volcanic

ash. Complete guidance on the issuance of NOTAM and ASHTAM is provided in Annex 15 — *Aeronautical Information Services*. Included in Annex 15 is a volcano level of activity colour code chart. The colour code chart alert may be used to provide information on the status of the volcano, with “red” being the most severe, i.e. volcanic eruption in progress with an ash column/cloud reported above flight level 250, and “green” at the other extreme being volcanic activity considered to have ceased and volcano reverted to its normal pre-eruption state. It is very important that NOTAM for volcanic ash be cancelled and ASHTAM be updated as soon as the volcano has reverted to its normal pre-eruption status, no further eruptions are expected by volcanologists and no ash is detectable or reported from the FIR concerned.

6.7 It is essential that the procedures to be followed by ACC personnel, including supporting services such as MET, AIS and ATFM should follow during a volcanic eruption/ash cloud event described in the foregoing paragraphs are translated into local staff instructions (adjusted as necessary to take account of local circumstances). It is also essential that these procedures/instructions form part of the basic training for all ATS, AIS, ATFM and MET personnel whose jobs would require them to take action in accordance with the procedures. Background information to assist the ACC or Flight Information Centre (FIC) in maintaining an awareness of the status of activity of volcanoes in their FIR(s) is provided in the monthly Scientific Event Alert Network Bulletin published by the United States Smithsonian Institution and sent free of charge to ACCs/FICs requesting it.

APPENDIX A

ANTICIPATED PILOT ISSUES WHEN ENCOUNTERING VOLCANIC ASH

1. ATCOs should be aware that flight crews will be immediately dealing with some or all of the following issues when they encounter volcanic ash:
 - a) Smoke or dust appearing in the cockpit which may prompt the flight crew to don oxygen masks (could interfere with the clarity of voice communications);
 - b) Acrid odour similar to electrical smoke;
 - c) Multiple engine malfunctions, such as stalls, increasing Exhaust Gas Temperature (EGT), torching, flameout, and thrust loss causing an immediate departure from assigned altitude;
 - d) On engine restart attempts, engines may accelerate to idle very slowly, especially at high altitudes (could result in inability to maintain altitude or Mach number);
 - e) At night, St. Elmo's fire/static discharges may be observed around the windshield, accompanied by a bright orange glow in the engine inlet(s);
 - f) Possible loss of visibility due to cockpit windows becoming cracked or discoloured, due to the sandblast effect of the ash;
 - g) Cockpit windows could be rendered completely opaque; and/or
 - h) Sharp distinct shadows cast by landing lights as compared to the diffused shadows observed in clouds (this affects visual perception of objects outside the aircraft).
 2. Simultaneously, ATC can expect pilots to be executing contingency procedures. This may include a possible course reversal and/or an emergency descent.
-

APPENDIX B

**ACTION TAKEN BY METEOROLOGICAL WATCH OFFICES (MWO) IN THE
EVENT OF A VOLCANIC ERUPTION**

1. On receipt of information of a volcanic eruption and/or the existence of volcanic ash, the MWO will:
 - a) Notify, if necessary, the VAAC designated to provide VAA/VAG for the FIR for which the MWO is responsible that a volcanic eruption and/or ash has been reported. In the event that the MWO becomes aware, from a source other than an ACC, of the occurrence of pre-eruption activity, a volcanic eruption or ash from any other source, the information will be passed with all available relevant details on the extent, forecast movement and concentration of volcanic ash immediately to the ACC and to the designated VAAC;
 - b) Reported differences between ash encounters by aircraft and the information published in VAA/VAG, SIGMET or NOTAM/ASHTAM received by an ACC shall be made available as soon as possible to the respective MWO, preferably in the form of an AIREP. The MWO will relay the information to the respective originators of the published information;
 - c) Notify adjacent MWOs designated to provide SIGMET that a volcanic eruption and/or ash cloud has been reported, provide available relevant details on the extent, forecast movement and (if known) concentration of volcanic ash. In the event that any other MWO becomes aware of the occurrence of volcanic ash cloud from any source other than the VAAC, the information should be passed immediately to the VAAC and any adjacent MWO(s) downstream of the moving ash cloud;
 - d) As soon as practicable, advise the ACC and the VAAC whether or not the volcanic ash is identifiable from satellite images/data, ground based or airborne measurements or other relevant sources;
 - e) Issue SIGMET relating to the horizontal and vertical extent of volcanic ash cloud and its expected movement for a validity period of up to 6 hours. The SIGMET shall include an observed (or forecast) position of the ash cloud at the *start* of the period of validity, and a forecast position at the *end* of the period of validity. The SIGMET should be based on the advisory information provided by the VAAC. Include in the SIGMET distribution list the three Regional OPMET Centres (ROC) in London, Toulouse and Vienna. As well as inter-regional distribution, the ROCs will ensure dissemination of the SIGMET to all the VAACs, the London World Area Forecast Centre (WAFC) and the three Regional OPMET Data Banks (RODB);
 - f) provide information to assist with the origination of NOTAM by ACCs and maintain continuous coordination with ACCs, adjacent MWOs and the VAAC concerned to ensure consistency in the issuance and content of SIGMET and NOTAM/ASHTAM; and
 - g) provide, if possible, regular volcanic briefings, based on the latest available ash observations and forecasts, to ACCs, ATFM units, Airport Operators and aircraft operators concerned, giving an outlook for beyond T+12 hours.
-

APPENDIX C

**ACTION TO BE TAKEN BY THE VOLCANIC ASH ADVISORY CENTRE (VAAC)
IN THE EVENT OF A VOLCANIC ERUPTION**

1. On receipt of information from a MWO or any other source, of significant pre-eruptive/eruption activity and/or a volcanic ash cloud observed, the VAAC should:

- a) Initiate the volcanic ash computer trajectory/dispersal model in order to provide advisory information on volcanic ash trajectory to MWOs, ACCs, ATFM units and operators concerned;
 - b) Review satellite images/data and any available pilot reports of the area for the time of the event to ascertain whether a volcanic ash cloud is identifiable and, if so, its extent and movement;
 - c) Inform the appropriate ATFM unit of the volcanic ash activity;
 - d) Prepare and issue advisories on the extent, and forecast trajectory, of the volcanic ash contamination in message format for transmission to the MWOs, ACCs, ATFM units and operators concerned in the VAAC area of responsibility, and to the three Regional OPMET Centres (ROC) in London, Toulouse and Vienna. As well as inter-regional distribution, the ROCs will ensure dissemination of the advisory to all the VAACs, the London World Area Forecast Centre (WAFC), and the three Regional OPMET Data Banks (RODB);
 - e) Monitor subsequent satellite information or other available observations to assist in tracking the movement of the volcanic ash;
 - f) Continue to issue advisory information (i.e. VAA/VAG), for validity periods T+0, T+6, T+12 and T+18 hours after data time, to MWOs, ACCs, ATFM units and operators concerned at least at 6 hour intervals, and preferably more frequently, until such time as it is considered that the volcanic ash is no longer identifiable from satellite data, no further reports of volcanic ash are received from the area and no further eruptions of the volcano are reported; and
 - g) Maintain regular contact with other VAACs and meteorological offices concerned, and, as necessary, the Smithsonian Institute Global Volcanism Network, in order to keep up to date on the activity status of volcanoes in the VAAC area of responsibility.
-

APPENDIX D

**PROCEDURES FOR THE PRODUCTION OF MODELLED ASH
CONCENTRATION CHARTS**

1. The following procedures are to be applied by the meteorological office of a Provider State, having accepted, by regional air navigation agreement, the responsibility for providing a VAAC within the framework of the International Airways Volcano Watch (IAVW).
 2. All VAA and VAG information issued by a meteorological office under designation as a VAAC within the framework of the IAVW shall be prepared in accordance with ICAO provisions.
 3. Additionally, where feasible, the meteorological office may issue modelled ash concentration charts and corresponding coordinate data files at 6-hourly intervals showing the different ash concentrations for the validity periods T+0, T+6, T+12 and T+18 hours after data time. These charts will show forecast ash distribution in terms of Areas of Low, Medium and High Contamination and be published at the same time, and with the same validity periods, as the VAA/VAG described above. Updated charts and data files should be distributed prior to the end of the validity time of those previously distributed.
 4. These data may be used by Provider States to prepare SIGMET, NOTAM/ASHTAM and to establish Danger Areas as appropriate.
-

APPENDIX E

RECOMMENDED ACTIONS BY STATES OF THE OPERATOR/REGISTRY WITH REGARDS TO AIRCRAFT OPERATIONS IN THE EVENT OF A VOLCANIC ERUPTION

Safety Risk Assessments For Flights In Airspace Proximate To Volcanic Ash

1 Introduction

- 1.1 It is recommended that States of the Operator/Registry as appropriate which intend to allow operators under their jurisdiction to operate in areas of volcanic ash contamination consider requiring operators to carry out a safety risk assessment prior to carrying out such operations.
- 1.2 Safety risk assessments should be completed prior to planned operations in airspace or to/from aerodromes which may be contaminated by volcanic ash.

2 Applicability

- 2.1 All operators conducting flights in airspace and/or to/from aerodromes which could be affected by volcanic ash.

3 Recommendations

- 3.1 In accordance with ICAO Annex 6, Chapter 3, paragraph 3.3- Safety Management, it is recommended that States of the Operator/Registry as appropriate require all operators, planning to operate in areas where the presence of volcanic ash is forecast, to carry out a safety risk assessment prior to planned operations. The safety risk assessment should include a requirement for the operator to:
 - a) Conduct their own risk assessment and develop operational procedures to address any remaining risks;
 - b) Put in place appropriate maintenance ash damage inspections; and
 - c) Ensure that any ash related incidents are reported by AIREP and followed up by a Volcanic Activity Report (VAR).
 - 3.2 Guidance in the preparation of such a safety risk assessment is provided in Appendix F of this document.
-

APPENDIX F

EXAMPLE SAFETY RISK ASSESSMENT PROCESS

1 Introduction

- 1.1 The safety risk assessment process is described in the *Safety Management Manual* (Doc 9859). The process involves identifying the hazards associated with the activity (in this case airspace proximate to volcanic ash or flying to and from aerodromes affected by volcanic ash), considering the seriousness of the consequences of the hazard occurring (the severity), evaluating the likelihood or probability of it happening, deciding whether the consequent risk is acceptable and within the organisation's safety performance criteria (acceptability), and finally taking action to reduce the safety risk to an acceptable level (mitigation).

2 Hazard Identification

- 2.1 A hazard is any situation or condition that has the potential to cause adverse consequences. A suggested list of topics, that is not necessarily exhaustive, to be considered is attached at **Appendix G**

3 The Safety Risk Assessment

- 3.1 Risk is an assessment of the likelihood and the severity of adverse consequences resulting from a hazard.
- 3.2 To help an operator decide on the likelihood of a hazard causing harm, and to assist with possible mitigation of any perceived safety risk, all relevant stakeholders should be consulted.
- 3.3 The safety risk from each hazard should be assessed using a suitably calibrated safety risk assessment matrix. An example risk assessment matrix is given in *Safety Management Manual* (Doc 9859) but an alternative which aligns with an organisation's own Safety Management System (SMS) would be equally appropriate. The safety risk should be derived by considering the severity of the safety outcome arising from the hazard, together with the likelihood of the outcome.
- 3.4 The severity of any adverse consequences resulting from a particular hazard should be assessed using a suitably calibrated severity scale. Example scales are given in *Safety Management Manual* (Doc 9859) but an alternative, which aligns with an organisation's own SMS, would be equally appropriate. Note that, for any flight, the safety outcome of a volcanic ash encounter may be significant.

3.5 Risk Likelihood

- 3.5.1 The likelihood or probability of adverse consequences resulting from a particular hazard should then be assessed. The likelihood should be agreed using a suitably calibrated likelihood or probability scale. An example probability scale is given in *Safety Management Manual* (Doc 9859), but an alternative which aligns with an organisation's own SMS would be equally appropriate.
- 3.5.2 When assessing likelihood or probability the following factors should be taken into account:
- The degree of exposure to the hazard.

- Any historic incident or safety event data relating to the hazard. This can be derived from data from industry, regulators, other operators, Air Navigation Service Providers, internal reports etc.
 - The expert judgement of relevant stakeholders.
- 3.5.3 The results of the assessment should be recorded in a hazard log, sometimes referred to as a risk register. An example of a hazard log is at **Appendix H**.

3.6 Risk Tolerability

- 3.6.1 At this stage of the process the safety risks should be classified in a range from acceptable to unacceptable. A suitable set of definitions for Risk Classification is given in *Safety Management Manual* (Doc 9859).
- 3.6.2 Appropriate mitigations for each identified hazard should then be considered, recorded on the hazard log and implemented. Mitigations must be adopted in order to reduce the safety risks to an acceptable level, but additional mitigation wherever reasonably practicable should also be considered where this might reduce an already acceptable safety risk even further. Thus, the mitigation process should reduce the safety risk to be as low as reasonably practicable.
- 3.6.3 Not all hazards can be suitably mitigated in which case the operation should not proceed.

3.7 Mitigating Actions

- 3.7.1 Mitigating actions by themselves can introduce new hazards. Where an organisation has an effective SMS then procedures will exist for continual monitoring of hazard, risk and involvement of qualified personnel in accepting the mitigating actions or otherwise. Operators without an effective SMS should repeat the safety risk assessment following any mitigation process and at regular intervals as the circumstances on which the original assessment was predicated may have changed. This ensures ongoing safety management or monitoring.

3.8 Records

- 3.8.1 The results of the safety risk assessment should be documented and promulgated throughout the organisation and submitted to the operator's national safety authority. Actions should be completed and mitigations verified and supported by evidence prior to the start of operations.
- 3.8.2 Any assumptions should be clearly stated and the safety risk assessment reviewed at regular intervals to ensure the assumptions and decisions remain valid.
- 3.8.3 Any safety performance monitoring requirements should also be identified and undertaken through the organisation's safety management processes.
-

APPENDIX G

**EXAMPLE TABLE OF CONSIDERATIONS FOR PLANNED OPERATIONS IN
AIRSPACE OR TO/FROM AERODROMES WHICH MAY BE CONTAMINATED
BY VOLCANIC ASH.**

| Considerations | Guidance |
|---|---|
| Operator Procedures | |
| Type Certificate Holder Guidance | Operators must obtain advice from the Type Certificate Holder and engine manufacturer concerning both operations in potentially contaminated airspace and/or to/from aerodromes contaminated by volcanic ash, including subsequent maintenance action. |
| Guidance for Company Personnel | <p>Publish procedures for flight planning, operations and maintenance.</p> <p>Review of flight crew procedures for detection of volcanic ash and associated escape manoeuvres.</p> <p>Type Certificate Holder advice on operations to/from aerodromes contaminated by volcanic ash including performance.</p> |
| Flight Planning | These considerations will be applicable to all flights that plan to operate in airspace or to/from aerodromes which may be contaminated by volcanic ash. |
| NOTAM and ASHTAM | The operator must closely monitor NOTAM and ASHTAM to ensure that the latest information concerning volcanic ash is available to crews. |
| SIGMETs | The operator must closely monitor SIGMETs to ensure that the latest information concerning volcanic ash is available to crews. |
| Departure, Destination and any Alternates | Degree of contamination, additional performance, procedures and maintenance consideration. |
| Routing Policy | Shortest period in and over contaminated area. |
| Diversion Policy | <p>Maximum allowed distance from a suitable alternate.</p> <p>Availability of alternates outside contaminated area.</p> <p>Diversion policy after an ash encounter.</p> |

G2
Volcanic Ash Contingency Plan – EUR and NAT Regions

| | |
|---|---|
| Minimum Equipment List / Dispatch Deviation Guide | <p>Consider additional restrictions for dispatching aircraft:</p> <ul style="list-style-type: none"> • air conditioning packs; • engine bleeds; • air data computers; • standby instruments; • navigation systems; • Auxiliary Power Unit (APU); • Airborne Collision Avoidance System (ACAS); • Terrain Awareness Warning System (TAWS); • provision of crew oxygen; and • supplemental oxygen for passengers. <p>(This list is not necessarily exhaustive.)</p> |
|---|---|

| Considerations | Guidance |
|------------------------------------|--|
| Operator Procedures | |
| Provision of Enhanced Flight Watch | Timely information to and from crew of latest information. |
| Fuel Policy | Consideration to the carriage of extra fuel. |

| Considerations | Guidance |
|-------------------------------|--|
| Crew Procedures | These considerations will be applicable to all flights that plan to operate in airspace or to/from aerodromes which may be contaminated by volcanic ash. |
| Pilot Reports | Requirements for reporting in the event of an airborne encounter. Post-flight reporting. |
| Mandatory Occurrence Reports | Reminder regarding the necessity for filing MORs following an encounter. |
| Standard Operating Procedures | <p>Review changes to normal and abnormal operating procedures:</p> <ul style="list-style-type: none"> • pre-flight planning; • operations to/from aerodromes contaminated with volcanic ash; • supplemental oxygen; • engine-out procedures; and • escape routes. <p>(This list is not necessarily exhaustive.)</p> |

G3
Volcanic Ash Contingency Plan – EUR and NAT Regions

| | |
|---------------|---|
| Technical Log | <p>Any actual or suspected volcanic ash encounter will require a tech log entry and appropriate maintenance action prior to subsequent flight.</p> <p>Penetration (detail and duration) of airspace or operations to/from aerodromes which may be contaminated by volcanic ash will require a tech log entry.</p> |
|---------------|---|

| Considerations | Guidance |
|-------------------------------|---|
| Maintenance Procedures | <p>Operators, who are operating in areas of ash contamination, are recommended to enhance vigilance during inspections and regular maintenance and potentially adjust their maintenance practices, based upon the observations, to prevent unscheduled maintenance. Observations should include signs of unusual or accelerated abrasions, corrosion and / or ash accumulation.</p> <p>Operator co-operation is requested in reporting to manufacturers and the relevant authorities their observations and experiences from operations in areas of ash contamination. If significant observations are discovered beyond normal variations currently known, manufacturers will share these observations, and any improved recommendations for maintenance practices, with all operators and the relevant authorities.</p> |

Note: The above list is not necessarily exhaustive and operators must make their own assessments of the hazards on the specific routes they fly.

H1
Volcanic Ash Contingency Plan – EUR and NAT Regions

APPENDIX H

EXAMPLE OF A HAZARD LOG (RISK REGISTER)

| HAZARD | | Incident Sequence Description | Existing Controls | Outcome (Pre-Mitigation) | | | Additional Mitigation Required | Outcome (Post-Mitigation) | | | Actions and Owners | Monitoring and Review Requirements |
|--------|-------------|-------------------------------|-------------------|--------------------------|------------|------|--------------------------------|---------------------------|------------|------|--------------------|------------------------------------|
| No. | Description | | | Severity | Likelihood | Risk | | Severity | Likelihood | Risk | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |

(additional rows as necessary)

APPENDIX I

EXAMPLE SIGMET, NOTAM, ASHTAM

Guidance on WMO headers referred to in Alerting Phase, paragraph 1.2.2 refers can be found in WMO No.386 Volume I (*Manual of Global Telecommunications System*) Part II (*Operational Procedures for the Global Telecommunications System*)

NOTAM Offices are reminded that ASHTAM (or NOTAM for volcanic ash) should be distributed via AFTN to their associated MWO, the SADIS Gateway and all the VAACs, in accordance with guidelines contained in ICAO Doc 9766 Chapter 4 paragraph 4.3.

1. SIGMET

WVUK02 EGRR 180105
EGGX SIGMET 2 VALID 180105/180705 EGRR-
EGGX SHANWICK OCEANIC FIR VA ERUPTION MT KATLA PSN N6337
W01901 VA CLD OBS AT 0100Z N6100 W02730 - N6100 W02230 -
N5800 W01730 - N5630 W02000 FL200/350 MOV SE 35KT FCST
0705Z VA CLD APRX N5800 W02000 - N5730 W01200 - N5500
W00910 - N5430 W01530 - N5800 W02000=

Note: PSN replaces LOC as per Amendment 75 to Annex 3 (applicable 18 November 2010)

2. NOTAM alerting pre-eruptive activity

(A0777/10NOTAMN
Q) BIRD/QWWXX/IV/NBO/W/000/999/6337N01901WXXX
A) BIRD B) 1002260830 C) 1002261100 E) INCREASED
VOLCANIC ACTIVITY, POSSIBLY INDICATING IMMINENT ERUPTION,
REPORTED FOR VOLCANO KATLA 1702-03 6337.5N01901.5W
ICELAND-S. VOLCANIC ASHCLOUD IS EXPECTED TO REACH 50,000
FEET FEW MINUTES FROM START OF ERUPTION.AIRCRAFT ARE
REQUIRED TO FLIGHT PLAN TO REMAIN AT LEAST XXXNM CLEAR OF
VOLCANO AND MAINTAIN WATCH FOR NOTAM/SIGMET FOR AREA.
F) GND G) UNL)

Note: XXX is a distance established by the Provider State in accordance with paragraph 1.2.1 a)

3. NOTAM establishing Danger Area after initial eruption

(A0778/10 NOTAMR A0777/10
Q) BIRD/QWWXX/IV/NBO/W/000/999/6337N01901WXXX
A) BIRD
B) 1002260900 C) 1002261200
E) VOLCANIC ERUPTION REPORTED IN VOLCANO KATLA 1702-03
6337.5N01901.5W ICELAND-S. VOLCANIC ASHCLOUD REPORTED
REACHING FL500. AIRCRAFT ARE REQUIRED TO REMAIN AT LEAST
XXXNM CLEAR OF VOLCANO AND MAINTAIN WATCH FOR
NOTAM/SIGMET FOR BIRD AREA.
F) GND G) UNL)

I2
Volcanic Ash Contingency Plan – EUR and NAT Regions

Note: XXX is a distance established by the Provider State in accordance with paragraph 1.2.1 a)

4. NOTAM establishing Danger Area to include Area of High [or High/Medium or High/Medium/Low] Contamination

(A0503/10 NOTAMN
Q) EGGN/QWWXX/IV/NBO/AE/000/350
A) EGPX B) 1005182300 C) 1005190500
E) TEMPORARY DANGER AREA HAS BEEN ESTABLISHED FOR
VOLCANIC ASH AREA OF HIGH CONTAMINATION IN AREA
5812N00611W 5718N00216W 5552N00426W 5629N00652W
F) SFC
G) FL350)

5. NOTAM to define Area of Medium Contamination for which a Danger Area has not been established

(A0207/10 NOTAMN
Q) EUEC/QWWXX/IV/AE/000/200
A) EIAA B) 1005190700 C) 1005191300
E) VOLCANIC ASH AREA OF MEDIUM CONTAMINATION FORECAST IN
AREA 5243N00853W 5330N00618W 5150N00829W
F) SFC
G) FL200)

6. ASHTAM alerting pre-eruptive activity

VALI0021 LIRR 01091410
ASHTAM 005/10
A) ROMA FIR B) 01091350 C) ETNA 101-06 D) 3744N01500E
E) YELLOW ALERT
J) VULCANOLOGICAL AGENCY

7. ASHTAM alerting eruptive activity

VALI0024 LIRR 01151800
ASHTAM 015/10
A) ROMA FIR B) 01151650 C) ETNA 101-06 D) 3744N01500E
E) RED ALERT F) AREA AFFECTED 3700N01500E 3900N01600E
3800N001700W SFC/35000FT G) NE H) ROUTES AFFECTED WILL
BE NOTIFIED BY ATC J) VULCANOLOGICAL AGENCY

8. ASHTAM alerting reduction in eruptive activity

VALI0035 LIRR 01300450
ASHTAM 025/10
A) ROMA FIR B) 01300350 C) ETNA 101-06 D) 3744N01500E
E) YELLOW ALERT FOLLOWING ORANGE J) VULCANOLOGICAL AGENCY

- END -